AIR CONDITIONING HEATING AND VENTILATING

DECEMBER, 1956—53rd Year

Air Curtain Installed in Sikorsky Helicopter Plant. See Page 67.

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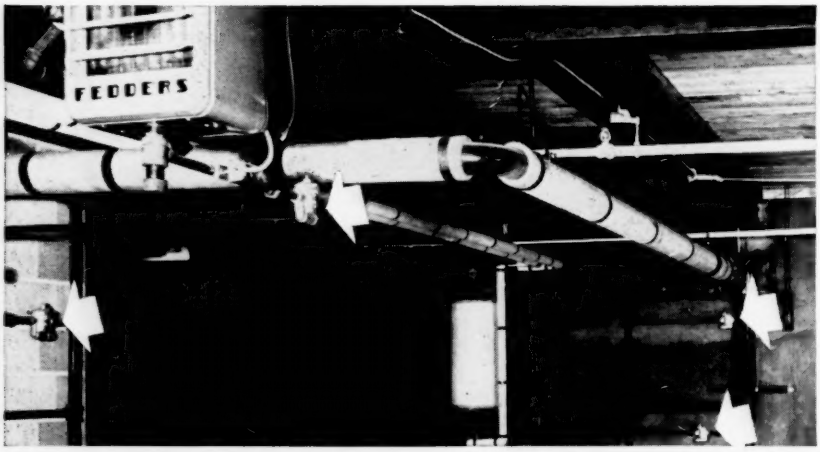
How One Company Has Saved $80,000 to Date by Buying 600 Steam Traps



Armstrong built-in strainer traps save maintenance as well as fuel at L. G. Balfour Co., Attleboro, Mass.

Joseph Brooks, Production Manager at Balfour, insists on "Armstrongs — *no substitute.*"

Armstrong Traps on Low Pressure, Vacuum Return Heating System Cut Fuel Costs $8,000 Per Year, Have Served 10 Years Without Repairs

YOU'D HAVE TO SELL a lot of fraternity pins to come out with $80,000 profit. But, that's the dollar-saving a couple of alert plant men have made by installing Armstrong steam traps at L. G. Balfour Company, fraternity jewelry makers of Attleboro, Mass. And, they've made their own jobs easier by doing it.

Just 10 years ago, Joseph Brooks, Production Manager, and C. J. Ripley, Maintenance Superintendent, installed the first Armstrong traps on their low pressure vacuum return heating system. Now they have 600 in use throughout the plant. The results have been an engineer's dream:

1. Fuel costs reduced $8,000 annually despite doubling of the factory's size and increased prices of coal.

2. One boiler did work of two after trap installation in original plant. Steam pressure was reduced from 50-75 lbs. to 22-27 lbs. Pressure is reduced to 4 lbs., with 6"-8" vacuum.

3. No trap repairs except cleaning in 10 years and no servicing of any kind where strainers were used ahead of traps. Armstrong Y-Type strainers have now been installed ahead of all No. 800 traps and all new traps are No. 880's with built-in strainer (costing less to buy and install than separate strainer and trap.)

This story of Balfour's $80,000 profit wouldn't be as significant if it were the only one of its kind. But, the frequency of such reports about Armstrong trapping establishes firmly the tremendous cost-reduction opportunities available to many plants throughout the country — perhaps to yours. Isn't it worth looking into?

Your local Armstrong Factory Representative or Distributor will survey your trapping without charge or obligation. Call him or write:

Bottom inlet and side inlet styles for all services.

FREE:
44-page Steam Trap Book —a complete guide to better trapping

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Company_____

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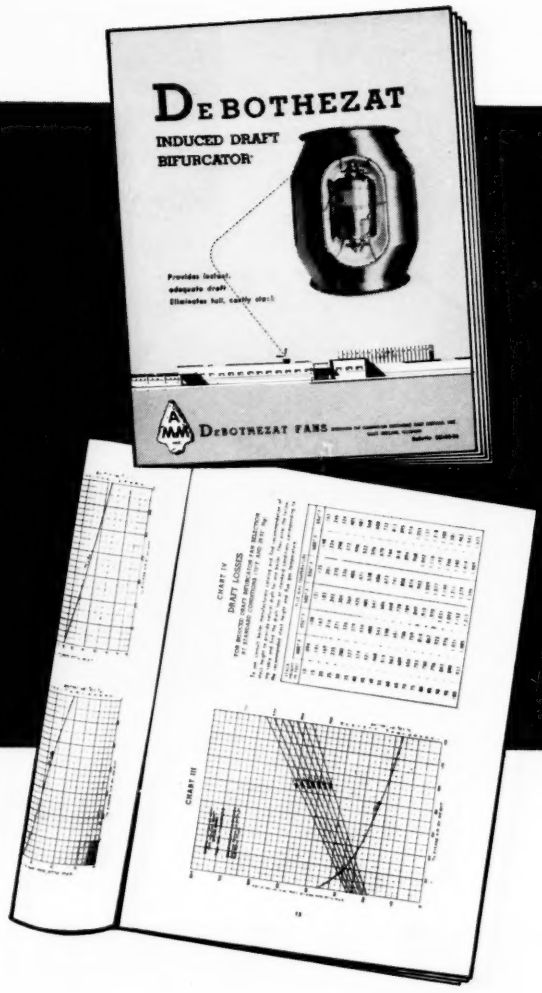

all boiler code ratings expressed in BTU/HR

A valuable working tool for both the engineer and contractor. This new 20-page catalog gives all manufacturers' organizations boiler code ratings reduced to their common relationship of BTU/HR delivered to the steam.

Also included are useful tables and charts on volume of flue gas for oil, gas and coal. Facts are given on the selection, use and installation of Induced Draft Bifurcator Fans. Performance data and complete specifications on all DeBothezat Induced Draft Bifurcators are outlined in detail.

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American Machine and Metals, Inc.
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in
Wall-To-Wall
Comfort

Tru-Perimeter Heating

WEBSTER WALVECTOR, in offices of Textile Machine Works, Reading, Pa.

Webster Tru-Perimeter Heating — with steam or forced hot water — creates a barrier of gentle warmth against the incoming cold along every exposed wall, in modern buildings everywhere. Webster Tru-Perimeter Heating provides uniform warmth with minimum floor-to-ceiling temperature difference, assures minimum fuel cost, sacrifices no usable floor space.

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- Custom Webster Walvector designed for complete buildings achieves economy in first cost by effectively coordinating heating applications with building design;
- Webster Baseboard Heating serves residential and many other buildings.

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AIR CONDITIONING HEATING AND VENTILATING

DECEMBER, 1956

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Published by
THE INDUSTRIAL PRESS

Executive, Editorial and Subscription Offices,
93 Worth St.,
New York 13, N. Y.
CA. 6-8120

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The Cover: Preparation area at entrance to spray booth in the helicopter plant, Sikorsky Aircraft Division, United Aircraft Corp., Stratford, Conn. Photograph, courtesy Albert Kahn Associated Architects & Engineers, Detroit, Mich.

AIR CONDITIONING, HEATING AND VENTILATING, published monthly by The Industrial Press, 93 Worth St., New York 13, N. Y. Executive, editorial and subscription offices, 93 Worth St., New York 13, N. Y. Entered as second-class matter, August 31, 1956, at the Post Office, East Stroudsburg, Pa., under Act of March 3, 1879.

Subscription Rates: In the United States and Canada, one year, $3; two years, $5; three years, $6; in all other countries, one year, $7; two year, $11. Single copies, 30 cents.

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Indexing and Microfilm: Contents of AIR CONDITIONING, HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and microfilmed by University Microfilms, Ann Arbor, Mich.

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Feeds water to boiler at 10 to 15 lbs.

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Dual Controls

Feeds water to boiler at 12 lbs. — Pressure relief at 30 lbs.

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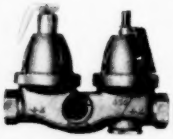
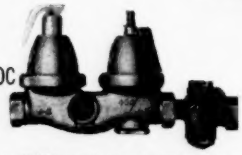
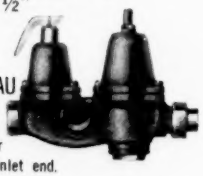


N450 Popular design Size ½"



N450C

Nos. N450C or 45AC have check valve and strainer

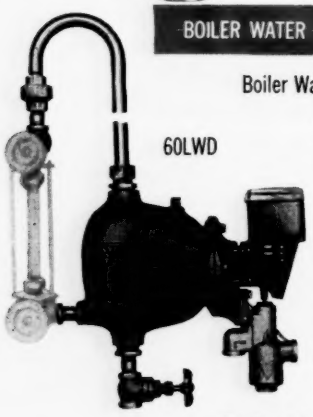


45AU

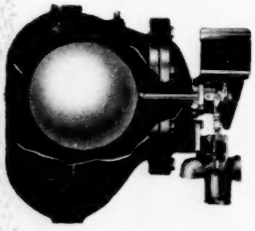
Nos. 45AU or N450U have sweat copper union applied to inlet end.

BOILER WATER LEVEL CONTROLS FOR LOW PRESSURE STEAM HEATING BOILERS

Boiler Water Feeders



60LWD



76LWD

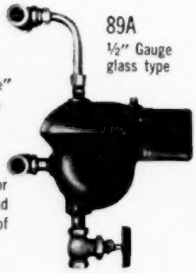
Feeder cut-off combinations

Low Water Cut-Offs

Maximum steam pressure 25 lbs.

101A Exclusive 2½" screw-in type with sediment chamber.

193A 2½" Screw-in type for use where shallow section and depth of jacket prevent use of No. 93A.



89A ½" Gauge glass type

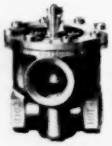
93A 2½" screw-in type

50A 1" Float chamber connections for use on process boilers and hot water heating boilers. Max. steam press. 50 lbs.

SERIES	CONNECTIONS	CAPACITY	STEAM	WATER
60	½" gauge glass	up to 5,000 sq. ft. rad.	25 lbs.	150 lbs.
76	1" chamber, ¾" feed valve	over 5,000 sq. ft. rad.	35 lbs.	150 lbs.
81	1" chamber, ¾" feed valve	over 5,000 sq. ft. rad.	35 to 75 lbs.	150 lbs.

OTHER PROTECTIVE & CONTROL DEVICES

36 Vacuum Relief Valve For use on steam coil heaters to prevent a vacuum. Size ¾".



71 Tempering Valve for tankless heaters. Sizes ½", ¾", 1".

152 Steam Regulator for process. Sizes ½", ¾", 1".

127 Steam Regulator for process and dead end service. Sizes ½" to 3".

WATTS

LARGEST AND MOST COMPLETE LINE OF ITS KIND IN THE WORLD

HIGH SPOTS

• Air Force personnel attended a four-day Refrigeration and Air Conditioning Conference, August 13-16 at Maxwell Air Force Base, Montgomery, Ala. Among speakers was Lincoln Scafe, Service Department Manager, The Trane Company, who outlined steps for **maintenance of refrigeration and air conditioning** equipment. He told Air Force men that to do an adequate job of maintenance there are three important points to be considered: First, a monthly program of inspection should be initiated. Second, it is important that once such a program is set up, that it be religiously adhered to. Third, that records be kept of each inspection indicating the work performed and parts or material required.

• Attendance of over 300 scientists and engineers is anticipated at the **Solar Furnace Symposium,** Jan. 21-22, in Phoenix, Ariz. Organized to bring American industry and governmental agencies the latest information on the role of solar furnaces in the study of materials at very high temperatures, program includes a visit to Arizona State College's solar furnace.

• The refrigerating plant for New York International Airport's projected **Terminal City** air conditioning system will break all New York area records for **total cooling output.** It will also be the world's largest installation of absorption units.

• New York City was warned on November 8 by Dr. Leonard Greenburg, Commissioner of Air Pollution Control, that within ten years **air pollution** could have disastrous effects on the health of its citizens. The commissioner put at $100 million a year the **economic loss** to New York's citizens through damage to buildings, equipment, and clothing. In addition he declared that air pollution **decreased ultra-violet radiation** which might be an important factor in the rise of lung cancer. This was upheld 5 days later when a report to the American Public Health Association by the National Cancer Institute stated that air pollution and not cigarette smoking was probably responsible for the increase in deaths from lung cancer.

• When two **Navy balloonists** soared to a **record altitude** of more than 14 miles on November 8 before plummeting unexpectedly but safely to earth, their vehicle was a seven-foot **pressurized aluminum globe.** To keep temperatures bearable, the gondola's bottom was painted black to absorb radiation from the earth while the top was white to reflect sun's radiation. A system of fans brought in heat from the bottom and cool air from the top. Although temperatures in gondola dropped as low as 32 deg F, the Navy men wore skin-tight pressure suits which helped them stay relatively comfortable.

• A contract for preliminary architectural plans and studies for a new **Engineering Center** in mid-Manhattan was signed by United Engineering Trustees, Inc. The American Institute of Chemical Engineers will be included in the project.

• An expanded program which includes rating and testing air-conditioning and refrigerating equipment, in addition to room air conditioners as announced in September, and formulation of policies which will give meaning and authority to **ARI Ratings** is being adopted by the Air-Conditioning and Refrigeration Institute, to the end that public and trade may have authoritative guidance as to performance capabilities when they consider installation of such equipment.

WASHINGTON OVERTONES

by LORING OVERMAN

For at least two reasons, the 85th Congress is expected to get its legislative programs under way rather slowly.

• First, the **closeness of the election**—insofar as Senate and House are concerned—requires legislators to make haste slowly while finding out how the new alignments are going to work out.

• Secondly, **crises overseas** make preparedness an extremely popular topic, one even more compelling than tax reductions.

Given these unexpected weeks of breathing-space, representatives of business, labor, defense agencies, and government will have more time in which to plead their cases.

Business, for example, plans a February "aircade" covering 10 metropolitan areas. Sponsored by the Chamber of Commerce of the United States, the aircade will seek to "kindle greater interest and action by American businessmen on major legislative issues before the 85th Congress."

• Among issues to be discussed: Farm legislation, foreign aid, **Taft-Hartley Act amendments** involving right-to-work laws and secondary boycotts; wage and hour proposals, **public housing,** Hoover Commission recommendations, federal intervention in education; taxes, and spending.

Labor, too, is hoping to capitalize on its support of winning candidates.

• Once pledged to repeal of Taft-Hartley, principal labor organizations now consider this goal unrealistic. Instead, they seek **revision.** One Taft-Hartley target is a provision permitting unions to be sued for damages resulting from unfair labor practices. **Broadening of the minimum wage** is another (teamsters') union goal. Another is the inclusion of Davis-Bacon provisions in all federally-financed construction contracts.

• Davis-Bacon provisions—written into the national road-building program, stipulate that wages as set by the federal government must be paid on federally financed construction projects. If extended to federal school-construction programs, (when and if approved) this provision could directly affect many plumbing, heating, and air conditioning contractors.

En Garde! Rapidity with which **Hungarian and Egyptian events** brought this nation to the brink of another conflict served to spotlight the continuing need for defense readiness. As a result, Washington took a second look at **arms and ammunition.** Seen were the following:

• **Nickel** must be conserved if regulation is to be avoided. "I appeal to private industry", said Defense Secretary Charles E. Wilson, "to cooperate with the Department of Defense by looking for places to save nickel in equipment outside military design control. We will not in future years be able to afford the lush expenditures of minerals we are making today."

• **Steel production,** reflecting war rumors and surprise demand for new cars, is expected to exceed rated capacity for the balance of the year. Proposals to build 31 new tankers emphasizes need for increased plate-making facilities.

• **Secretary of Labor** was authorized, in event of attack upon the United States, "to be responsible for the development of preparedness measures relating to the expansion of the labor force, and to the distribution, utilization and compensation of the civilian labor force." (Defense Mobilization Order 1-10, Revised).

• **Small Business Participation** in defense contracts is encouraged by new progress payment rules contained in Defense Department Directive No. 7800.4, dated November 16. Purpose of the directive: "(1) to insure that the need for **advance**

(Concluded on page 8)

TOUGH!

SINGLE THIN SHEET OF LAMINATED FOIL LIFTS 6 MEN!

New Aluminum Insulation Uses Sheets of Amazing Strength—Can Take Abuse

Just on the market, this new tough barrier to heat flow, vapor flow, and condensation formation is ideal for insulating factories, residences, hospitals, schools, stores, warehouses, garages; particularly where the insulation is left exposed. *It can take considerable abuse!*

It is important to remember that reflectivity, absorptivity, and emissivity of heat rays or Radiation, are physical properties inherent in the SURFACES of aluminum or of any other material. Thickness is never a factor.

The surfaces of a sheet of paper, for example, have a low 6% reflectivity for heat rays and a correspondingly high 94% absorptivity and emissivity. By covering each side of kraft paper with aluminum foil, a TOUGH 3-ply laminate is produced which has the 97% reflectivity of aluminum, plus its 3% absorptivity and 3% emissivity. It also has 80% reflectivity for LIGHT RAYS; and when exposed, brightens interiors, reduces electric bills.

The laminated aluminum sheets have almost zero permeability to vapor. Infiltration under the flat stapled flanges is slight. *Scientific* aluminum insulation is prefabricated to open automatically, in one operation, into multiple layers of aluminum, fiber, and reflective air spaces. This type of construction minimizes condensation formation. Condensation promotes timber rot, peeling paint, cracking plaster, deterioration of brick, stone, and steel. Heat flow by conduction is slight because air spaces have low density. The layers of fiber and aluminum retard convection, inner and outer.

Facts on heat flow and how to retard it are contained in the new 48-page booklet "Heat Flow by Radiation in Buildings, Simplified Physics," an illustrated, authoritative manual by Alexander Schwartz, noted lecturer and writer. Use coupon for a free copy, and samples.

THERMAL VALUES, INFRA TYPE 4S

Up-Heat C .105 = 3⅛" insulation*
Wall-Heat C .068 = 4¾" insulation*
Down-Heat C .042 = 7⅞" insulation*

*Non-metallic insulation based on limiting values of Fed. Spec. HH-I-521c

Cost installed between wood joists, material and labor, about 8¢ sq. ft.

Type 6 also available

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( ) Send booklet "Radiation etc."

( ) Samples of Infra 4SLL.

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WASHINGTON OVERTONES *(Concluded from page 6)*

or progress payments by contractors will not be treated as a handicap in awarding contracts; (2) to facilitate and accelerate the making of progress payments requested by small business under Government contracts, and (3) to emphasize the usefulness and desirability of providing proper contract financing assistance to small business concerns."

• Small business got another defense break with the establishment, by the Air Research and Development Command, of a new procurement agency, the **Executive for Small Business.** The new agency, located at ARDC headquarters in Baltimore, will have field offices at each ARDC center. It will provide a one-step counseling service for small business firms. Heading the program is John C. Eiden, former administrative officer in the Office of the Director for Research and Development, Headquarters, USAF.

• Small Business Administrator Wendell B. Barnes, pointing out that the big business share of defense contracts is decreasing, said: "The small business share of defense contracts in the last three fiscal years was 21.8%, compared with 18% in the three previous years. The small business share of all government buying—defense and civilian—during the last three fiscal years was 22.2%, compared with 19.4% in the three previous years."

* * *

Housing Opinions Differ:

• Two Washington big-wigs—one charged with keeping housing at practicable levels, and the other with his hands on the mortgage money purse strings—do not see eye to eye. HHFA Administrator Albert Cole puts it this way: "I think we have reached a point where we **must not risk a continued drop-off** in the availability of **home financing."**

• Says Undersecretary of the Treasury Burgess: "It gives the market a chance to absorb the very heavy building of recent years. It is a partial brake on the rise in building costs which would threaten seriously to narrow the market for houses."

• Meanwhile, new housing starts moved up slightly in October to an annual pace of 1,050,000 a year. Starts had dropped to the million-a-year rate in September, lowest since January, 1952.

* * *

About Fuels

• Scuttling of 15 ships in the Suez canal, thus forcing oil shipments around the southern tip of Africa, is requiring major readjustments among fuel users.

• **Fuel Oil Shortage** in this country is not unlikely, with prices up to reflect emergency conditions. An extra 200,000 to 300,000 barrels of crude per day would be needed to meet minimum needs in Europe.

• **Long-Range Outlook** for domestic oil production is favorable. Several steel mills will have new pipe-producing facilities in operation in 1957 and 1958.

• **In an emergency** the Interior Department's Office of Oil and Gas could quickly place oil and gas under government control. The office (OOG) has its plans in readiness, and a roster of former executives who could be called back into service.

• **Defense Department** is also taking a long look at the **petroleum** situation. A new instruction No. 3020.10, dated November 5, states conditions under which the military may contract for storage, handling and distribution of petroleum. To qualify, facilities must conform to standards of dispersal and protection fixed by the Defense Department.

• **Canadian Natural Gas** for mid-West consumers was considered a possibility during November. Federal Power Commission indicated it might change its policy with regard to Canadian gas. Involved is the importation of 204 million cubic feet of gas per day from central Canada, and exportation of 48 million cubic feet daily to Eastern Canada. Full hearings on the subject were promised.

1906

The open trolley car was a popular engineering contribution to summer-time comfort and pleasure. 1906 marked the introduction of the first *Brunner-engineered* product.

TODAY

. . . with the newly-designed BAC "packaged" models, and a complete line of open-type condensing units.

BRUNNER MANUFACTURING COMPANY, UTICA, N. Y.
THE BRUNNER CO., GAINESVILLE, GA.
IN CANADA: BRUNNER CORP. (CANADA) LTD., TORONTO, ONTARIO

PROVEN QUALITY
50th Anniversary
BRUNNER
SINCE 1906
DEPENDABLE

New BAC "packaged" models are available in 3, 5, 7½ and 10 H.P. sizes. Smaller and more compact, these new units are attractively finished in Hammertone Green.

Open-type Condensing Units available in a wide range of sizes . . . ¼ through 100 H.P.

BRIEFLY STATED

• **William P. Chapman** has joined the executive staff of the engineering department of Johnson Service Co., Milwaukee, Wis. His duties will include major assignments in connection with the company's expanded research and development program. He is author of the series on Calculating the Heat Requirements of a Snow Melting System currently appearing in Air Conditioning, Heating and Ventilating.

• The **Building Research Institute** announced the establishment of a **Plumbing Research Committee** as recommended by the **National Association of Plumbing Contractors,** a BRI member. The Committee will study a proposal for a coordinated plumbing industry research program and the advisability of forming a plumbing research institute supported in part by industry.

• **Paul L. Sackett** has been named Boston area branch manager for the Industrial Division of the York Corporation subsidiary of Borg-Warner. During World War II, he collaborated with the United States Army Engineers in the design of cold storage plants and Army facilities in the New England District.

• **Francis A. Noll** has been appointed director of engineering for Amana Refrigeration, Inc., Amana, Iowa. Engaged in household refrigeration work for nine years, he joined Amana a year ago as chief cabinet engineer.

• **The Hays Corporation,** Michigan City, Ind., has expanded its engineering department facilities by increasing the experimental engineering work area. A new engineering annex has more than tripled the available work space for engineers and technicians. Included is electronic test equipment, new engineering drafting facilities, and an expanded gas analysis instrument test rack.

• All rights to manufacture and distribute Daffin humidifiers have been sold by Daffin Manufacturing Co., Lancaster, Pa. and the Lancaster Engineering Corp., Hazleton, Pa., to the **Hermidifier Co.,** Neffsville, Pa.

• Dole Refrigerating Company, Chicago, manufacturers of the "Cel" line and pioneers in the industrial refrigeration industry, announce the following changes in their executive staff effective October 1, 1956. **O. L. Rose,** Vice President, Secretary-Treasurer, and Assistant General Manager, will go into partial retirement, after eighteen years service with Dole Refrigerating Co., Chicago, Ill. **Harold P. Hansen,** General Sales Manager, and former Canadian Branch Manager, has been appointed Assistant General Manager; **George E. Frankel,** Comptroller, was elected Secretary-Treasurer; **John E. Hutchinson,** currently Research and Development Engineer, will take over the post of General Sales Manager; and **Bruce P. Tweed,** Western Division Sales Manager, has been recalled to the home plant and will head the Research and Product Development Division of Dole.

• Five new directors were elected by the members of the Air Moving and Conditioning Association at their annual meeting. Each new director represents an important product division of the Association. Elected for a one year period, beginning January 1, 1957, they are: **F. W. McKenna,** chief engineer, Kennard Corp., St. Louis, Mo., representing the Central Station Air Conditioning Unit Div.; **E. C. Englert,** sales manager, Hartzell Propeller Fan Co., Division Castle Hills Corp., Piqua, Ohio, representing the Industrial Axial and Propeller Fan Div.; **J. P. Johnson,** sales manager, Ventilating Div., The Swartout Co., Cleveland, Ohio, representing the Power Roof Ventilator Div.; **B. G. Krause,** manager, Air Controls, Inc., Cleveland Heater Co., Cleveland, Ohio, representing the Residential Fan Div.; **T. L. Arnold,** sales manager, Heating Div. of Fedders-Quigan Corp., Trenton, N. J., representing the Unit Heater Div.

• One of the pioneers in modern heating and air conditioning in Canada, **Grant E. Cole,** 59, executive vice president and general manager of Trane Company of Canada, Limited, will retire effective January 1, 1957, because of ill health. **Edwin C. Phillips,** vice president and assistant general manager since 1952, will succeed him.

• Beginning of construction of a new $300,000 Chicago office-warehouse was announced recently by **The Powers Regulator Co.,** Skokie, Ill. The 16,000-sq ft building will house the Chicago sales offices of the automatic temperature control firm.

• **Temprite Products Corp.,** Birmingham, Mich., has purchased the **EverHot Water Heater Co.,** a Detroit manufacturer of home water heaters since 1919, which will now operate as the **EverHot Heater Division of Temprite.** EverHot personnel will remain unchanged.

• **William E. Konrad** has been appointed merchandising manager for the heating and air conditioning department of Crane Co., Chicago, Ill. He will direct the company's warm air heating and air conditioning sales program, and will coordinate activities of the heating and air conditioning sales division and advertising department.

• **William M. Day** has been named director of engineering for Bryant Manufacturing Co., Indianapolis, Ind. Mr. Day comes to Bryant following eleven years with Perfection Industries, Division of Hupp Corp., where he directed the engineering program.

• Watrous Division of The Imperial Brass Mfg. Co., Chicago, Ill., has appointed five representatives to handle the company's line of flush valves and liquid and lather soap dispensers. **D. E. Weidner,** Spokane, Wash., will cover Montana, eastern Washington, and northern Idaho; **B. R. Hitpas Co.,** Denver, Colo., Colorado and Wyoming; **C. G. Leggett,** New Orleans, La., southern Louisiana; **Chas. G. Davis,** Albuquerque, N. M., New Mexico and El Paso County, Texas; **Gene Arledge Co., Inc.,** Jackson, Mass., Mississippi.

(Concluded on page 12)

St. Genevieve's School, Flourtown, Pa.
Nolen & Swinburne, Architects

Today's most versatile form of perimeter heating for churches, schools, hospitals . . .

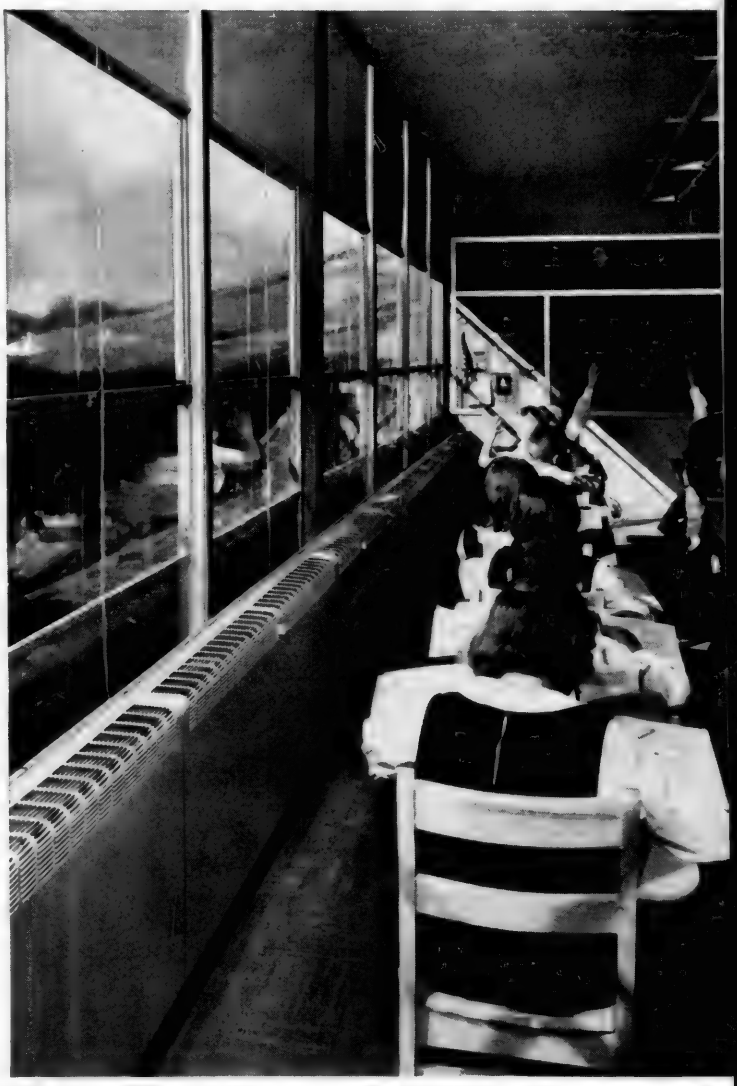
SILL-LINE RADIATION

Sill-line fits this structural condition with ease and grace

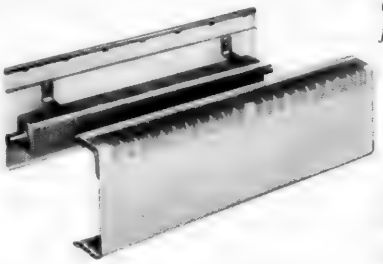
Architect, contractor and manufacturer team up through Nesbitt Sill-line Radiation to provide an indoor thermal environment conducive to comfortable living—work, play, study, and worship.

Sill-line is a perimeter type of high-capacity fin-and-tube radiation housed in a beautiful casing that fits any occasion and enhances the modern interior.

It will pay you to put Sill-line on your team.



Only Nesbitt Sill-line Radiation with its full one-piece back could fit with economy this mullioned wall-skin construction



Quick and easy to install!
Full one-piece back for true and rigid alignment; needed accessories to eliminate all cutting; 16-gauge enclosures; baked enamel finish, choice of colors. Five casing styles; seven lengths; eight heating elements, steam or hot water; approved ratings, 2.9 to 12.1 sq. ft. EDR.

Send for Publication 102

Nesbitt
SILL-LINE RADIATION
Made and sold by JOHN J. NESBITT, INC., Philadelphia 36, Pa.

BRIEFLY STATED

(Concluded from page 10)

• **S. J. Toth** has been assigned to the newly-created position of special assistant to the managing director of Honeywell-Brown, Ltd., London subsidiary of Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The move is part of an expansion program in automatic heating controls reflecting a fast growing market in Great Britain.

• A further step in international industrial cooperation between Canada and the United States was effected by the election to membership in the **Air Moving and Conditioning Association** (AMCA) of five top Canadian companies in this field. The firms are **American-Standard Products Ltd., Canadian Blower & Forge Co., Sheldons Engineering Ltd., B. F. Sturtevant Co. of Canada, Ltd.,** and **Trane Co. of Canada, Ltd.**

• Modine Manufacturing Co., Racine, Wis., has appointed five new sales representatives for the company's Heating and Air Conditioning Div. **William D. Burk** is sales representative in newly established territory which embraces the whole of Alaska and the Yukon area; **Gene Arledge Co.** is the representative for the Jackson, Miss., territory, and **J. C. Kelly Co.** will serve the Spokane, Wash., area; the New Orleans territory will be covered by **R. E. Newlin and Associates,** while the company's representative in the Raleigh, N. C., area will be **L. R. Gorrell.**

• **M. L. Franzel** has been named St. Louis assistant regional manager for the Airtemp Division, Chrysler Corp. He was formerly district manager for the company's Denver, Colo., sales district.

• Baltimore Aircoil Co., Inc., announces the appointment of **R. E. Newlin & Associates** as exclusive sales representative in Mississippi and southern Louisiana.

• **Mortimer Freund,** member of Eadie, Freund & Campbell, consulting engineers, died recently. The two surviving partners will continue under the original firm name with offices at 500 5th Ave., New York 36, N. Y.

• **Clyde E. Ploeger,** a veteran in the field of refrigeration development, is the new Director of Engineering for the Evansville Division of the Bendix-Westinghouse Automotive Air Brake Co.

• Modine Manufacturing Co., Racine, Wis., announces that **M. J. Druse,** director of advertising and public relations, has been given the additional assignment of market research manager.

• Three more U. S. manufacturers have been added to the growing membership of the recently-formed **Air Moving and Conditioning Association** (AMCA). **The Trane Co., Modine Manufacturing Co.,** and **L. J. Wing Manufacturing Co.** bring the total number of member companies to 56.

• **Howard A. Reid** has been appointed executive assistant to the vice president in charge of sales for Walworth Company, New York. He will coordinate advertising, market research, sales training, sales promotion and public relations for the company.

• Appointment of two veteran employees to top jobs in the All-Year Air Conditioning Division of Servel, Inc., Evansville, Ind., was announced. **Robert K. Eskew,** former chief engineer for air conditioning products, was named sales manager of the division, and **John N. Davidson,** former manager of the company's Defense Division, succeeds Eskew as chief engineer.

• **Carl E. Rowe** has been appointed vice-president and general manager of the Milwaukee Valve Co., Milwaukee, Wis. Mr. Rowe was also made a director of the firm. For the past 2 months he has been working as assistant general manager of the company.

• **A. G. Wirick** has been appointed manager of manufacturing for the Evansville Division of Bendix-Westinghouse, Evansville, Ind. Under his direction, the production facilities for the new division will be among the most modern in the refrigeration field.

• **P. Roger Lynn** was elected vice president in charge of engineering of Cordley & Hayes, New York, at a directors' meeting. Mr. Lynn moves up to vice-president from director of field engineering for the 67-year old water cooler manufacturing company.

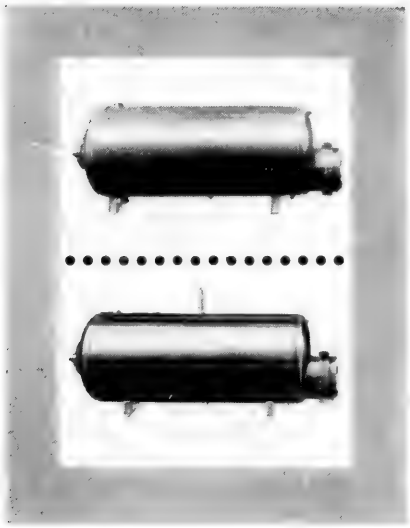
• Appointment of **Enterprise Heat & Power Co.,** Chicago, Ill., as exclusive midwest distributor for the Heat Recorder-Totalizer is announced by the **Heat Timer Corp.** of New York.

• The Crane Company heating school began its seventh year on Oct. 15 with a class at the North Shore Hotel, Evanston, Ill. This three week basic course is given three times annually. The first of four advanced two week courses began Nov. 5, and the first of three two-week commercial sessions began Nov. 26, all under the tutelage of **Walter Kehm,** 26-year veteran with the company.

• Opening of a sales office and warehouse at 54 Pane Road, Newington, Conn., is announced by **Line Material Co.,** Milwaukee, Wis. Field engineer C. L. Hopkins will use the new building for his service center.

• Copeland Refrigeration Corp., Sidney, Ohio, announces the appointment of **James E. Barker** to the position of assistant sales manager. Following five years with the McCray Refrigerator Co., Kendallville, Ind., he joined Copeland in 1954 as sales engineer.

• Appointments to the Dallas-region engineering and sales staff are announced by Airtemp Division of Chrysler Corp. **G. H. Gray,** formerly with Baker Engineering Co., Lubbock, Tex., and **G. H. Stephan,** former field engineer with McCrory Stores Corp., are joining as field engineers; **T. G. Hendricks,** formerly with Friedrick Refrigerators, Inc., as district manager.

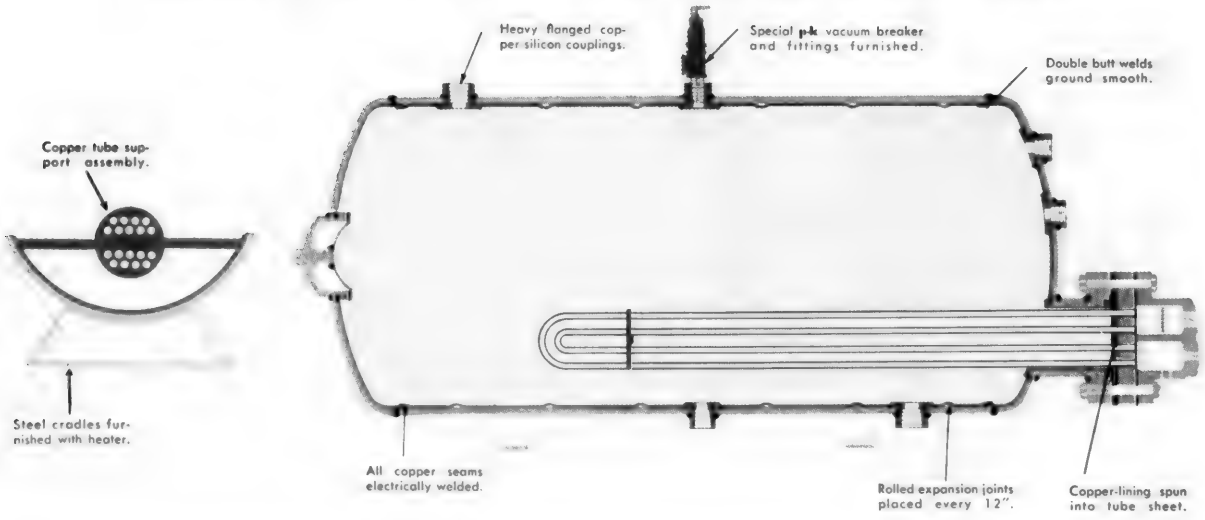


WHICH OF THESE

Copper-Lined HEATERS

WOULD YOU SPECIFY?

ONLY ONE has all these features


Heavy flanged copper-silicon couplings.
Special p-k vacuum breaker and fittings furnished.
Double butt welds ground smooth.
Copper tube support assembly.
Steel cradles furnished with heater.
All copper seams electrically welded.
Rolled expansion joints placed every 12".
Copper-lining spun into tube sheet.

Like twins, copper-lined heaters can look pretty much alike—on the outside. But *inside*, and on key points of construction, they can be as different as day and night.

Engineers experienced in copper-lined heaters are aware of these vital differences and specify accordingly.

They insist, for instance, on rolled joints every 12 inches around the full circumference of the lining to allow for longitudinal expansion . . . on the copper-lining being not less than 3 lb. per square foot . . . on heavy flanged copper silicon couplings, welded to both the shell and the lining . . . on enough tube supports . . . on an adequately long tube bundle with parallel "U" bends . . . and on a vacuum breaker valve to protect the lining from sudden pressure fluctuation. They make sure that separate hydrostatic and pneumatic tests are run to guarantee that linings will be leakproof.

These experts specify these details, and others, found only in P-K heaters, because they know that heaters built *without* such safeguards are false economy; but that heaters "built right," like P-K's "Indestructo" copper-lined heaters, assure trouble-free service year after year.

Like the full story? We've detailed the key construction features in sample specifications and in P-K's new Catalog 19. Ask your local P-K representative for copies or write today.

The Patterson-Kelley Co., Inc., 1020 Burson Street, East Stroudsburg, Pa.

Patterson Kelley

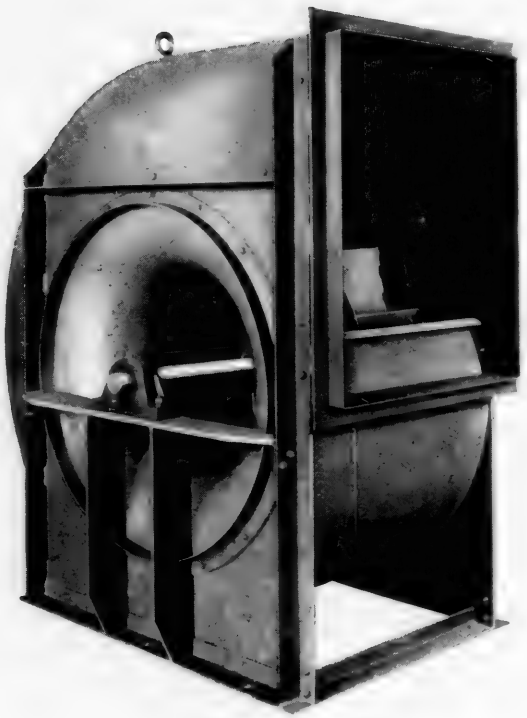
2598

storage water heaters • instantaneous heaters • convertors • fuel oil heaters • freon chillers and condensers

nyb

centrifugal fans...

STANDARD AND HEAVY DUTY



Skillfully Engineered, Accurately Rated, Feature Heavy Welded Steel Construction

Two types of fan wheels. Housing dimensions remain the same but performance characteristics differ.

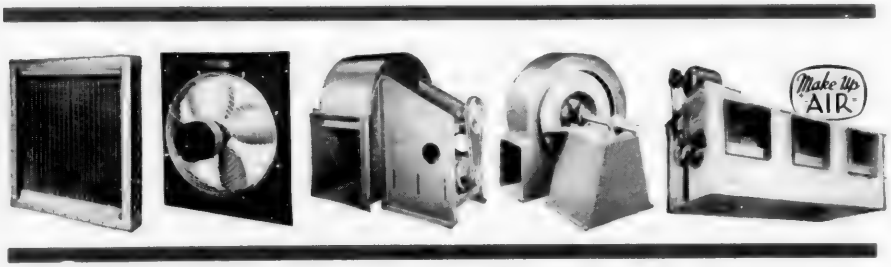
Forward Curve wheels offered from 7½ to 73 inch. Capacities up to 70,000 cfm.

Quiet operating, medium speed (IPL) wheels with non-overloading horsepower characteristics for heating, ventilating and air conditioning or industrial applications. Wheel diameters from 15 inch to 73 inch, with any speed or discharge required. Capacities up to 123,000 cfm. Class I, II, or III construction.

All-welded housing featured as standard construction for simplicity, extra strength and rigidity—dust tight and leak proof. Bolted (knock-down) type available in Class I and Class II. Split housing can be furnished as extra if required.

Write for Bulletins 544 and 561

nyb products have 65 years of manufacturing experience and engineering knowledge built into them. All **nyb** products are laboratory tested, accurately rated and fully guaranteed in strict accordance with standard test codes.



When working on your air handling problems, consult the *nyb* representative nearest you in our nationwide service or write for bulletins.

nyb

THE NEW YORK BLOWER COMPANY

SALES OFFICES • 3165 SOUTH SHIELDS AVENUE • CHICAGO 16

FACTORY, LAPORTE, INDIANA

Built-in snow removal called for piping dependability —they used Wrought Iron

Not just snow melting—but *dependable* snow melting—was the leading design objective for this access ramp.

That's why designers of the new Connecticut General Life Insurance Company office building gave such careful consideration to material selection for this access ramp. Four major factors supported the use of wrought iron for this job: its corrosion-resistance—rugged strength—low coefficient of expansion with concrete—ease of fabrication.

In addition to snow melting service, wrought iron pipe was also installed for well water and cold water lines, chilled water mains, and well water piping in the heating and cooling system. Our booklet, "Byers Wrought Iron for Snow Melting Systems," offers case-history support for wrought iron's reliability in this service. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Division Offices in Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N.Y.

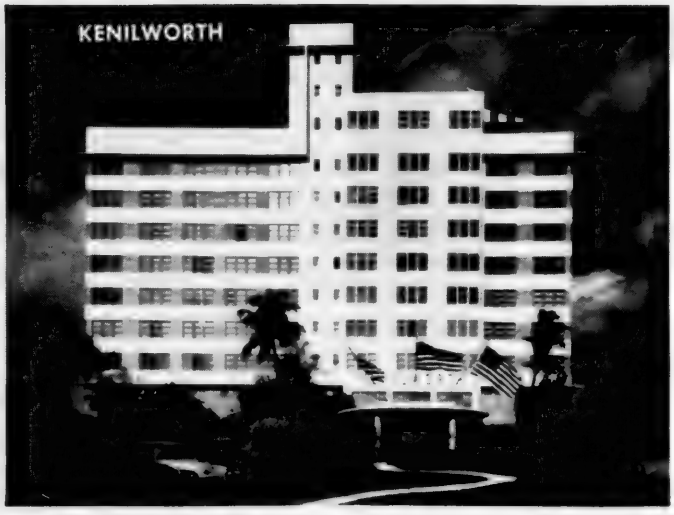
Available in Canada and throughout the world

Connecticut General Life Insurance Company
Office Building: Hartford, Connecticut
Architect: Skidmore Owings & Merrill, New York, N.Y.
Engineer: Syska & Hennessy, Inc., New York, N.Y.

Contractors: Turner Construction Company, New York, N.Y. (General Contractors)
Cobra Pipe and Coil Company, Elmwood, Conn. (Snow Melting)
C. H. Cronin, Inc., New York, N. Y. (Plumbing)
Kerby Saunders, Inc., New York, N. Y. (Heating and Air Conditioning)

BYERS *Wrought Iron Tubular and Hot Rolled Products*

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS



Beth-Co-Weld Pipe in air-conditioning systems of these Miami Beach hotels

Three sumptuous ocean-front hotels at Miami Beach have one point in common: Hundreds of feet of Beth-Co-Weld steel pipe in the air-conditioning systems. The pipe for each installation was furnished by A & B Pipe & Supply Company and installed by Hill-York Sales Corporation, both of Miami.

Beth-Co-Weld is ideal pipe for air-conditioning systems, and for heating and plumbing work, and sprinkler installations, because it is so easy to cut and thread. It's sound pipe, with a tight weld, because it is made from good steel by the continuous-weld process.

While the demand for steel pipe is heavy, jobbers are making every effort to carry stocks of Beth-Co-Weld in these sizes:

DIAMETER	WEIGHT	LENGTHS
½ to 4 in.	Standard	21 ft, plus or minus 1 in.;
½ to 3 in.	Extra Strong	also random lengths

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

ANNOUNCING···

Revised Code Numbers for

genetron SUPER-DRY REFRIGERANTS

. . . in the interest of standardizing refrigerant terminology and nomenclature

PRESENT GENETRON CODE NUMBER	CODE NUMBER TO BE USED EFFECTIVE JAN. 1	COLOR-CODE	REFRIGERANTS
genetron 11	**11**	ORANGE LABEL	TRICHLOROMONOFLUOROMETHANE
genetron 12	**12**	WHITE LABEL	DICHLORODIFLUOROMETHANE
genetron 141	**22**	GREEN LABEL	MONOCHLORODIFLUOROMETHANE
genetron 226	**113**	PURPLE LABEL	TRICHLOROTRIFLUOROETHANE
genetron 320	**114A**	DARK BLUE LABEL	DICHLOROTETRAFLUOROETHANE

In the interest of helping to standardize refrigerant terminology and nomenclature, General Chemical is adopting the revised code numbers shown above for its "Genetron" Super-Dry Refrigerants, effective January 1, 1957.

These numerical designations reflect recommendations of trade and technical associations throughout the industry which have been working jointly and independently on many standardizations, including a common numerical code system for fluorinated hydrocarbon refrigerants.

The numerals for two of the most widely used "Genetrons"—"Genetron" 12 and "Genetron" 11—already conform and, accordingly, are not being changed.

"Genetron" Super-Dry Refrigerants are stocked and recommended by America's leading air conditioning and refrigeration wholesalers. When ordering from them in the year ahead, please use these revised code numbers to designate the "Genetrons" you need.

Allied Chemical

Basic Chemicals for American Industry

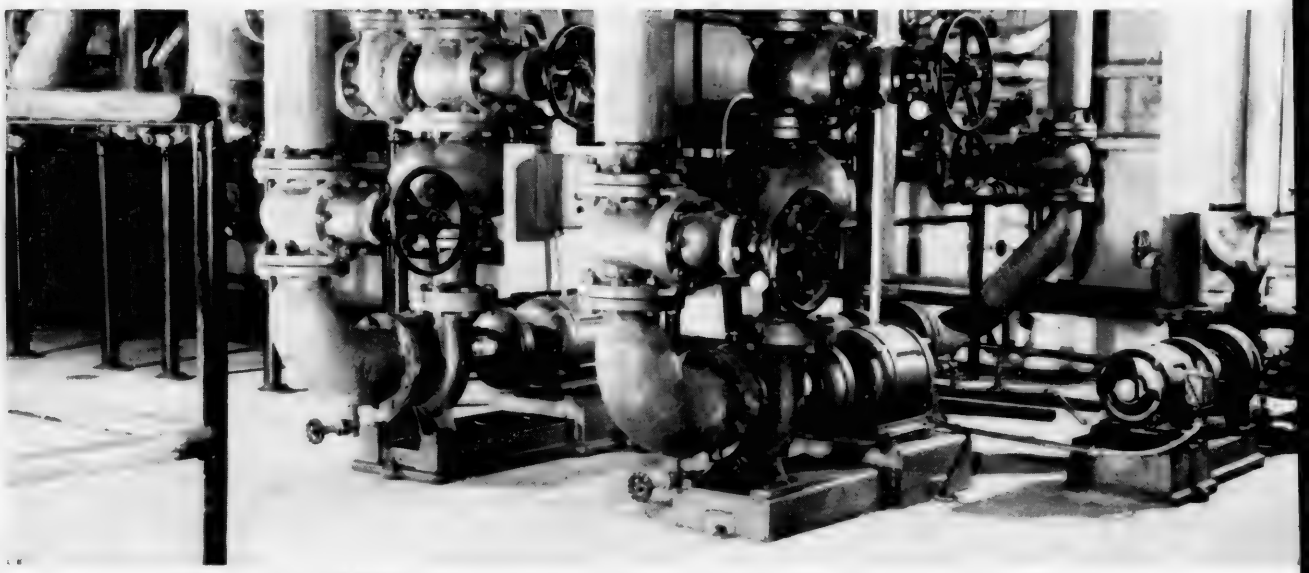
GENETRON DEPARTMENT

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

B & G UNIVERSAL PUMPS... designed specifically for



Battery of silent B&G Universal Pumps circulating a two-pipe, reverse return hot water heating system.

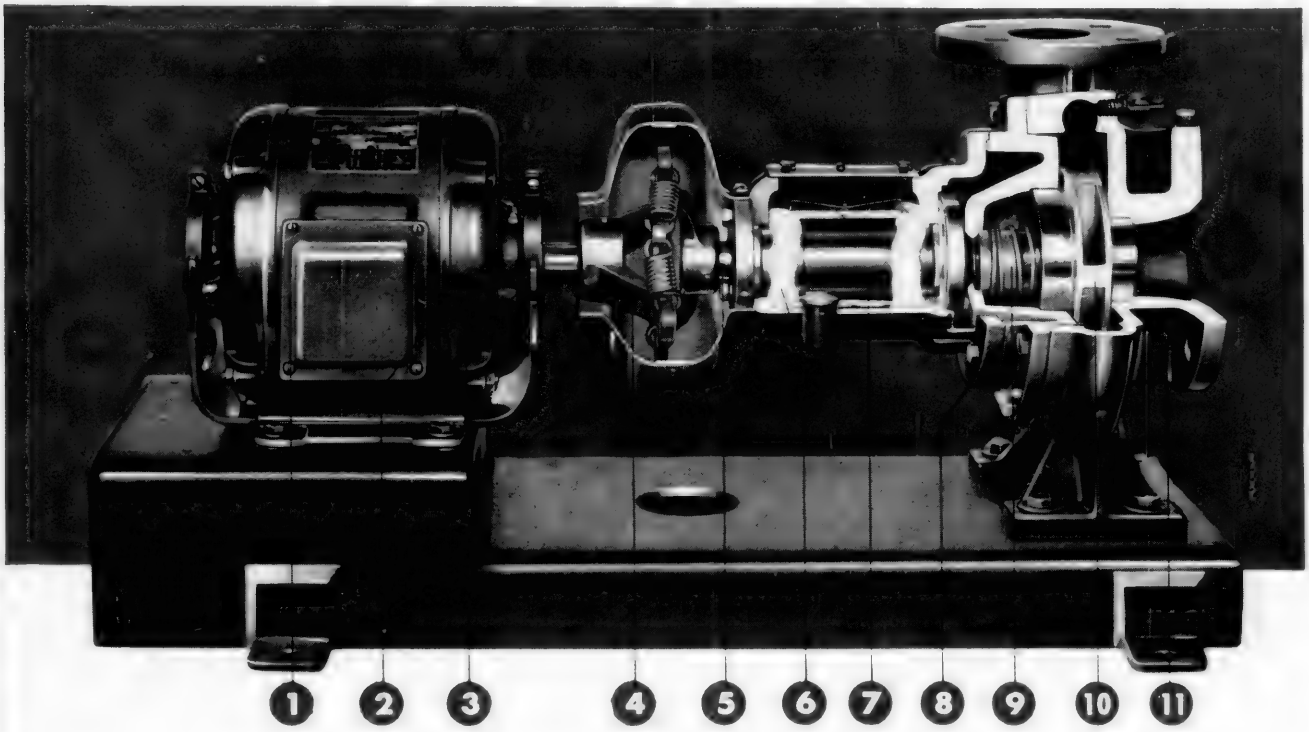
Notre Dame High School, Niles, Ill., is heated with unit ventilators and radiant panels, supplied by B&G Universal Pumps.

The National Home Office of the Allstate Insurance Company, equipped with B&G Universal Pumps.

A B&G Universal Pump is installed here to raise city water pressure.

These multi-story apartment buildings depend on B&G Universal Pumps for quiet operation.

Quiet Operation in liquid Heating and Cooling systems



For forced hot water heating systems where noise control is a factor, a circulating pump must have more than mere ability to meet head and capacity requirements. *Silent and vibrationless operation must be given first consideration!*

Below are eleven reasons why the B&G Universal Pump fully satisfies these operating demands. No vibration eliminators or flexible connections to the piping are needed—no special rubber, spring or resilient bases.

THE MOTOR

1. **Extra quiet...non-overloading.** B&G Universal Motors are specially constructed, selected and stamped for *extra-quiet* operation. They are non-overloading—a Universal Pump will operate satisfactorily along its entire capacity curve.

2. **Sleeve bearings.** Universal Motors are equipped with oil lubricated sleeve bearings for silent performance and long life.

3. **Mounting.** For extra assurance of noiseless operation, Universal Motors, through 5 HP, are NEMA ring-type mounted and completely suspended in rubber. All motors are drip-proof.

THE PUMP

4. **Spring-type coupler.** Another warranty of silent operation. Provides excellent pump and motor protection against the strain of starting torque.

5. **Shaft.** The Universal shaft is *oversized*—affording large bearing surfaces. Made of hardened, special alloy steel, polished to a mirror finish. The integral thrust collar absorbs end-thrust—lengthens seal and motor bearing life.

6. **Lubrication.** Universal pumps use an oil lubricating system. No grease to channel with resulting bearing failure. Oil level indicator permits visual check.

7. **Sleeve bearings.** A "must" for quiet, vibrationless operation and long life of both pump and motor. An exclusive Universal feature!

8. **Removable bearing frame!** To service pump, the entire bearing frame assembly with impeller is easily removed from volute. No pipe connections to break or motor to remove—all the advantages of split case design. Bearing frame assemblies are interchangeable.

9. **Mechanical seal.** This time-proved Seal positively prevents water leakage up to full design pressures. The Seal is self lubricating and features a floating seat of "Remite"—a diamond-hard, highly polished ceramic material developed by B&G.

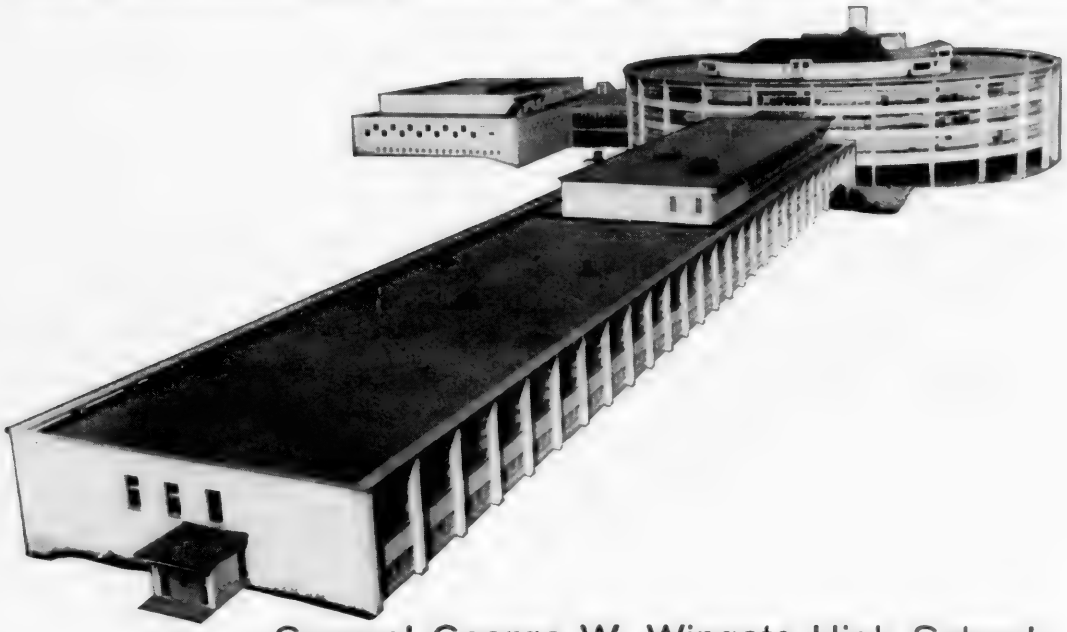
10. **Hydraulically balanced impeller.** Balancing chamber and thrust pressure relief holes in the impeller reduce thrust to a minimum, lengthening pump life.

11. **Solid type volute.** Support feet directly below volute absorb ever-present piping strains without distorting pump alignment.

BELL & GOSSETT
COMPANY
Dept. EP-4, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, W. Toronto

"MASSACHUSETTS goes

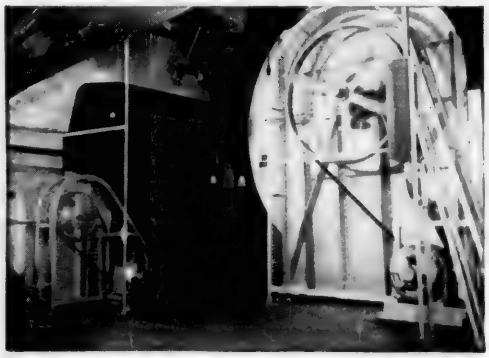
DURING THE POST-WAR SCHOOL BUILDING PROGRAM FOR NEW YORK AND "MASSACHUSETTS" FANS AND BLOWERS IN SCHOOLS IN THE FOLLOWING 13 SCHOOLS; H. SAND & CO. 10 SCHOOLS; DIERKS HEATING CO. 7 SCHOOLS; AFGO ENGINEERING CO. 3 SCHOOLS; PIPE AND ENGINEERING CO. 3 SCHOOLS;



General George W. Wingate High School

"THE BANJO SCHOOL"

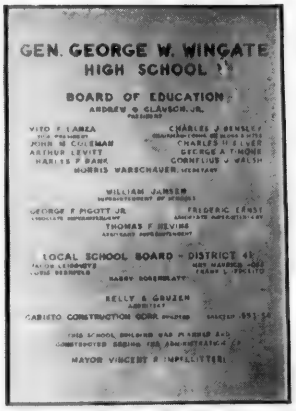
General George W. Wingate High School (the "Banjo" School). The most radical departure to date from official preconceptions of what a school should look like. This high school is extremely practical as to light, spaciousness, audiovisual facilities, traffic, auditorium, skylighted studios, isolated music wing, library, capacity (3200 students), exterior (glass, aluminum, greenish-white glazed brick), ventilating system (Massachusetts fans and blowers), economy in construction, $900,000.00 under appropriation.



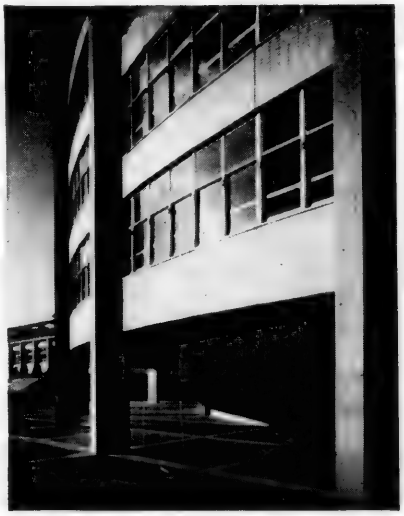
FANS FOR AUDITORIUM AND KITCHEN.

to school"

URBAN AREAS, HEATING AND VENTILATING CONTRACTORS INSTALLED QUANTITIES* . . . . . D. J. RICE, INC. 44 SCHOOLS; HARRY STARKMAN BROS. HEATING MAINTENANCE CORP. 6 SCHOOLS; NORMAN HEATING CO. 3 SCHOOLS; EDWARD B. KEARNEY & CO., INC. 2 SCHOOLS.



EDWARD B. KEARNEY CO., INC.
HEATING AND VENTILATING
CONTRACTORS



CLOSE UP VIEW SHOWING
SECTION OF "BANJO".

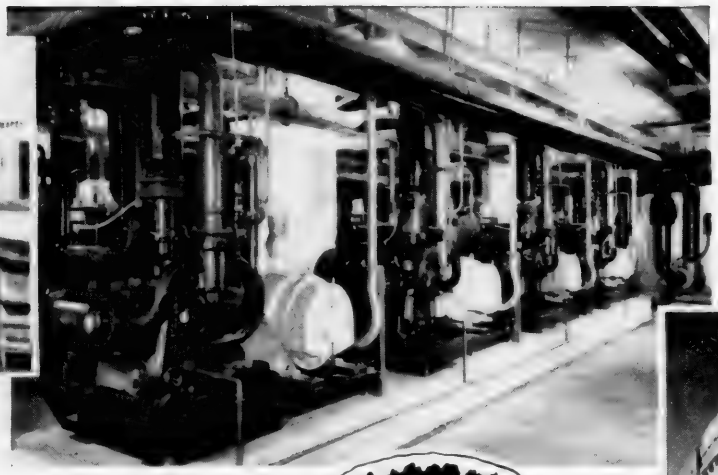
FANS FOR BOYS GYM AND
LOCKER ROOMS.
(DUPLICATE INSTALLATION FOR GIRLS).

FANS FOR CLASS ROOMS.

*PARTIAL LIST

The BISHOP & BABCOCK Mfg. Co.

Frick unit air conditioners are built in 3, 5 and 7½ horsepower sizes.



Eight Frick "ECLIPSE" compressors, each with nine cylinders, air condition both the 11-story buildings of the American National Insurance Co. in Galveston, Texas.

TRADE FRICK MARK®

Air Conditioning and Refrigeration

The Industry's Most Complete Engineering Service

Including surveys, sales-engineering, design, manufacture, shipment, installation, and maintenance.

Built into Frick equipment are 50 years' experience in air conditioning, 74 in refrigeration, and 103 in engineering. Nowhere else can you get this combination of unique engineering experience, complete systems and complete service—on any commercial or industrial cooling load, with any refrigerant, at any temperature!

Branches and distributors the world over: write for literature and estimates today.

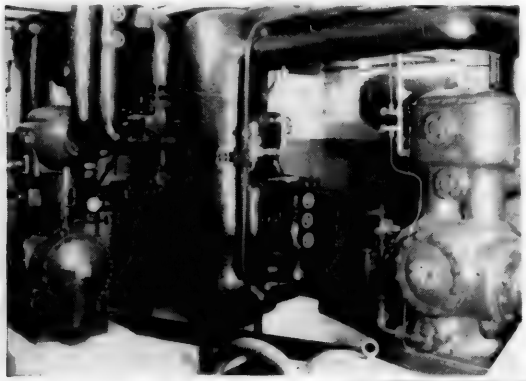
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

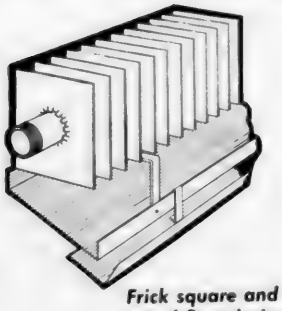
WAYNESBORO, PENNA. U.S.A.

Fragmented Shell-Ice is produced automatically: plants making block ice available in any size.

Below: Ammonia booster systems save power on quick-freezing work.



Synthetic-rubber reactors handle batches over twice as fast when cooled with patented Frick coils.



Frick square and spiral finned pipes save valuable space.

In writing for literature, please describe the cooling work you wish to do.

How to produce a QUIET revolution... and win more sales!

Specify Fafnir
Super-Quiet Ball Bearings
for heating and
air-conditioning equipment

Designed expressly for residential heating and air-conditioning equipment, Fafnir Super-Quiet Ball Bearings feature balls and races specially finished for quiet performance.

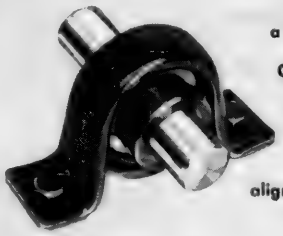
These advance-design bearings offer an inexpensive way to reduce noise, increase sales appeal. Prelubricated with factory-filtered grease and equipped with Plya-Seals to keep grease in and dirt out, they never need relubrication or maintenance. Moreover, Fafnir Super-Quiet Ball Bearings, with self-locking collars, are easiest of all to install . . . lock securely to the shaft with a twist of the wrist.

Available in sizes to fit brackets using popular-size sleeve bearings, Fafnir Super-Quiet Ball Bearings come mounted in electric current-conducting rubber cartridges and rubber-cushioned pillow blocks. Send for bulletin containing complete information and specifications. The Fafnir Bearing Company, New Britain, Conn.

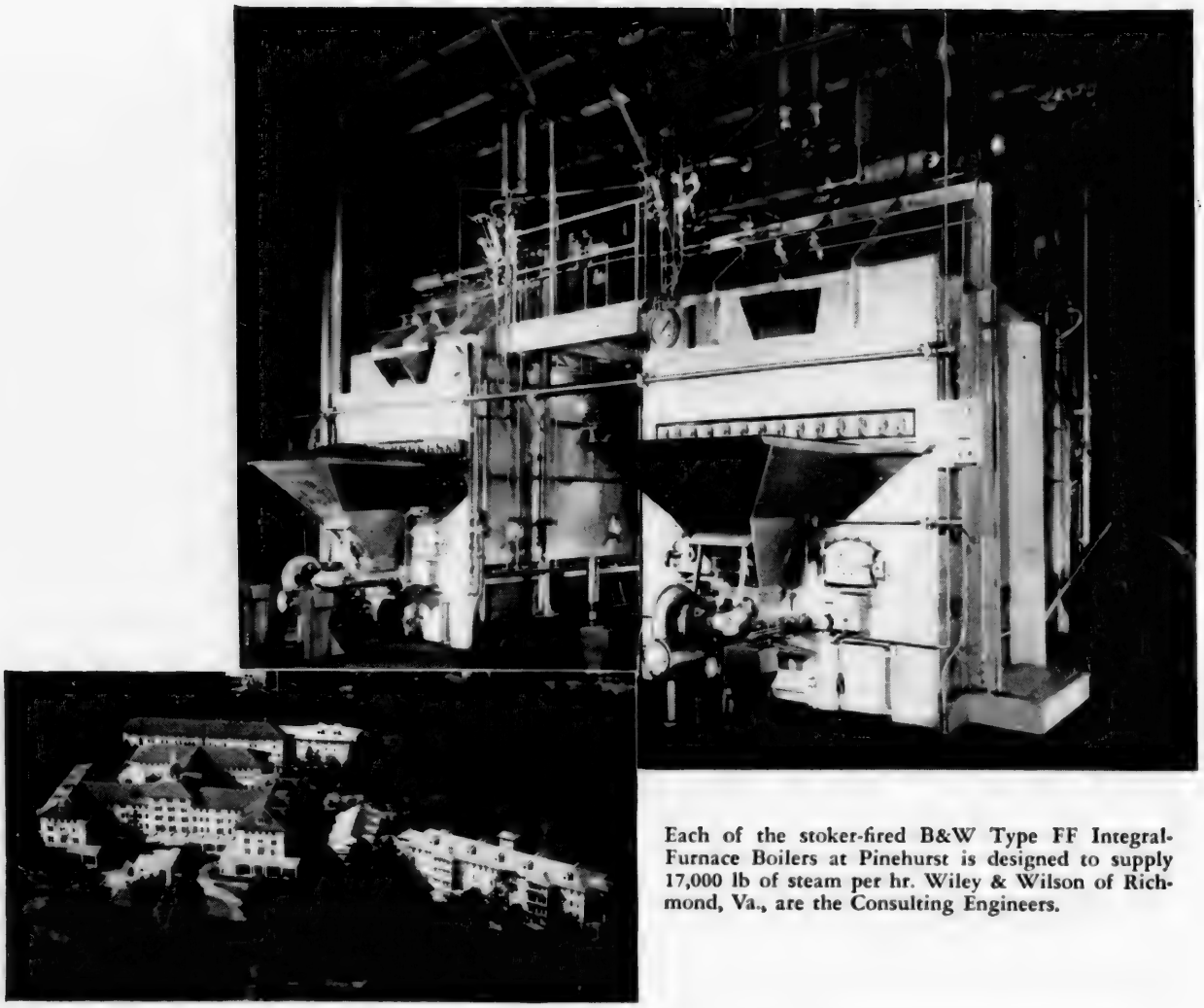
FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

are designed to be interchanged with other makes of ball bearing rubber-cushioned cartridges . . . feature Fafnir Super-Quiet Ball Bearings.

also equipped with the Fafnir Super-Quiet Ball Bearing, are designed for interchanging with sleeve bearing mountings.



a completely packaged, low cost Fafnir Super-Quiet Ball Bearing unit, features compact, two-piece, pressed-steel housing . . . is quickly mounted, affords unrestricted initial alignment in all directions.



Each of the stoker-fired B&W Type FF Integral-Furnace Boilers at Pinehurst is designed to supply 17,000 lb of steam per hr. Wiley & Wilson of Richmond, Va., are the Consulting Engineers.

STEAM COSTS ⅓ LESS AT PINEHURST

Two B&W Boilers Help Cut Fuel and Other Plant Costs at North Carolina Resort

The need for a dependable steam supply that is also efficient and economical led Pinehurst, Inc. to install two coal-fired B&W FF Boilers in re-vamping its central steam plant. A famous winter resort, Pinehurst can't take chances with its steam supply. It must have as much steam as it needs, when and where it is needed. These new boilers replaced five older units to supply steam for all purposes to ten buildings, three of them hotels. In an emergency they provide steam for electric power generation.

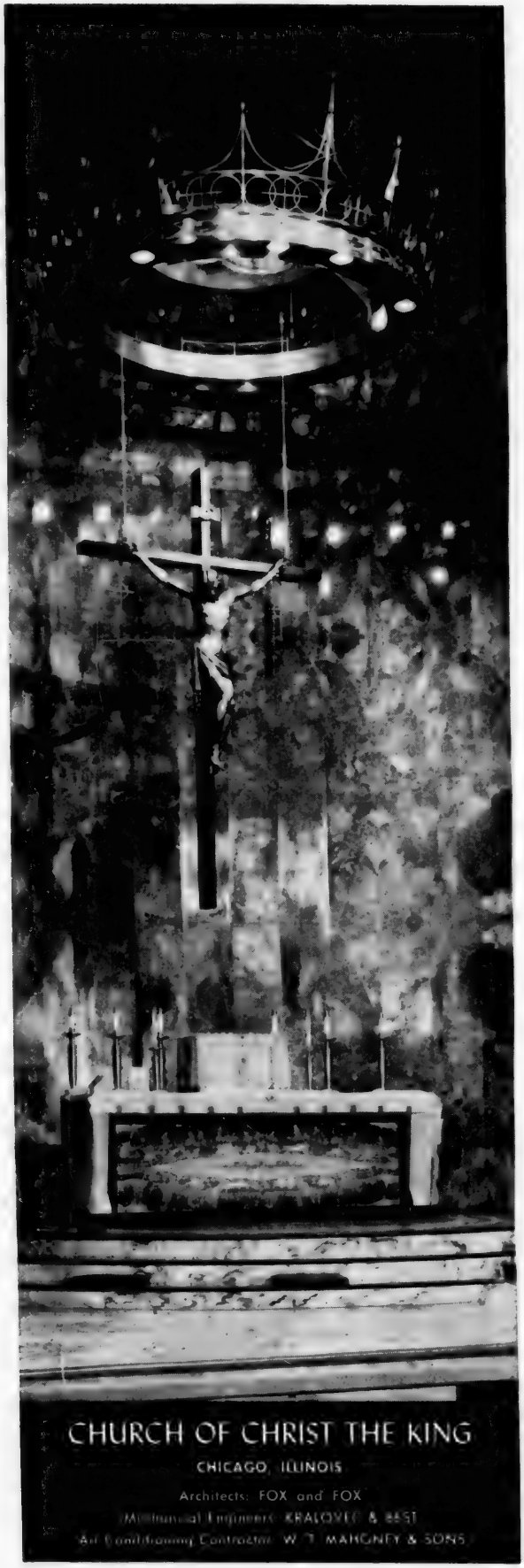
By this modernization of its boiler plant, Pinehurst, Inc. gets more steam from less coal and at less cost. And, with automatic boiler controls, simplified coal- and ash-handling and substantially reduced maintenance, other costs have also been shaved.

If you use steam for power, processing or heating, be sure that your steam dollar is giving you full value. If you think it isn't, B&W will be glad to put 90 years of steam generation experience at your disposal, to help you modernize or expand your steam plant for important, long-term savings. Write, The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-788



CHURCH OF CHRIST THE KING
CHICAGO, ILLINOIS
Architects: FOX and FOX
Mechanical Engineers: KRALOVEC & BEST
Air Conditioning Contractor: W. T. MAHONEY & SONS

Why More and More

Air Conditioned Churches

Are Controlled by POWERS

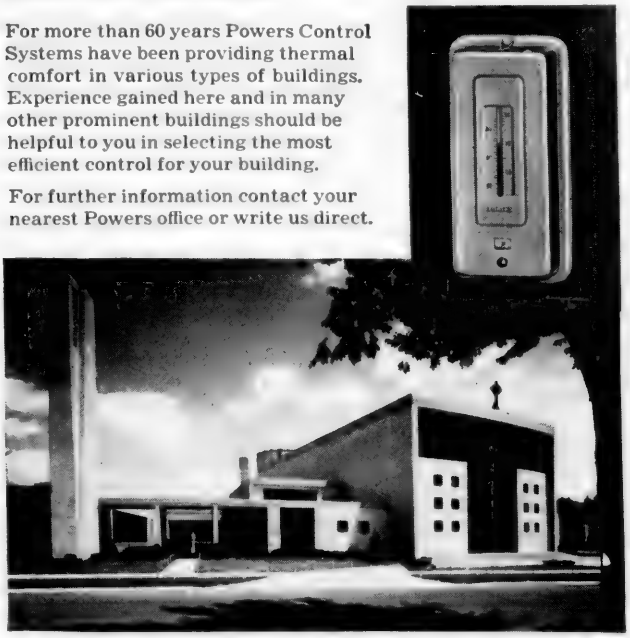
POWERS

Year 'round AIR CONDITIONING Control System

used in this distinguished modern church helps provide these important benefits: (a) light and airy appearing church due to use of large glass areas, without penalties of cold drafts or excessive solar heat; (b) people attending weddings, funerals and other services leave church without feeling and looking wilted in hot weather, no drooping altar candles; (c) closed windows reduce cleaning bills and outdoor noises; (d) increased attendance due to greater year 'round comfort.

For more than 60 years Powers Control Systems have been providing thermal comfort in various types of buildings. Experience gained here and in many other prominent buildings should be helpful to you in selecting the most efficient control for your building.

For further information contact your nearest Powers office or write us direct.



THE POWERS REGULATOR CO.

SKOKIE, ILLINOIS | *Offices in Chief Cities in U.S.A., Canada and Mexico*

Over 60 Years of Temperature and Humidity Control

(c51)

Announcing a giant stride in air conditioning . . .

The New Honeywell

A new principle of control that virtually eliminates high velocity air distribution problems

HONEYWELL'S High Velocity Air Blender offers engineers the answer to today's major problems with high velocity air distribution systems.

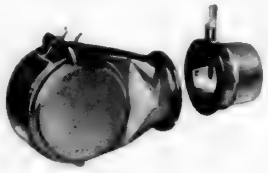
Now each room served by the system can be individually controlled by its own thermostat, providing a constant comfort level—never too hot, never too cold, never drafty, regardless of the demands put on the system by other occupants or outside weather.

The key to this efficient performance is Honeywell's calibrated dial air balancing system that regulates the total CFM flow of air leaving the blender.

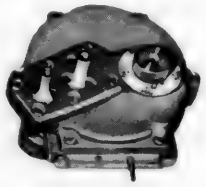
With this system, even though the hot and cold valves are not linked mechanically, they work in unison delivering the exact total flow (CFM) needed to heat or cool a room. There's no excess drain on the system to supply one room that frequently upsets the system flow and temperature in other rooms. And with dial air balancing the system is in balance as soon as it's installed.

Self-powered, the Honeywell Air Blender uses the air pressure of the high velocity air it is controlling to actuate its diaphragm—its *only* moving part.

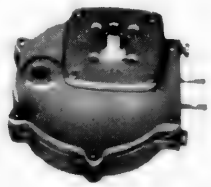
Cold Valve—(containing the diaphragm—the only moving part), controls the total air flow from the unit.



Hot Valve—like the cold valve, but with a scale on the variable orifice as part of *dial balancing* system.



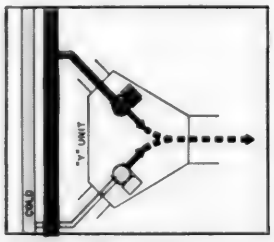
Flow Regulator—with calibrated dial (CFM or inches of water) to pre-set the total flow of the unit.



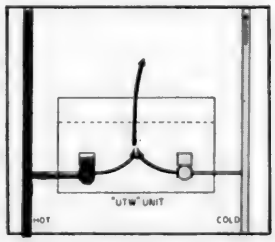
Submaster Regulator—similar to the Flow Regulator but field adjustments aren't needed on this device.

Basic components of the Honeywell high velocity air blender system with typical installations

Honeywell Round Type Thermostat—connects by tube to the Submaster Regulator, providing direct control over *flow*, rather than usual valve position.

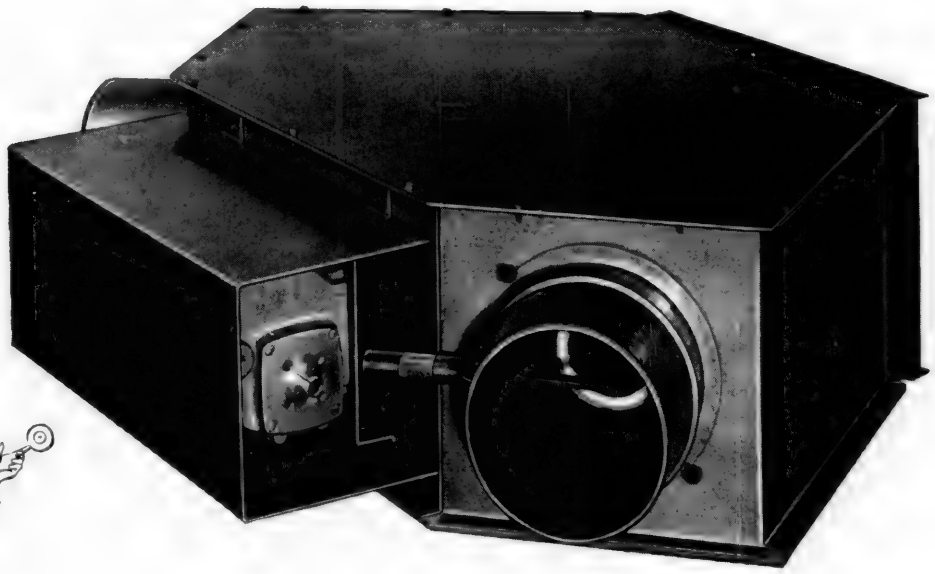


"Y" Unit (as illustrated on the opposite page)—this is the conventional packaged unit supplied by Honeywell.



Under-the-Window Installation—the air blender valves and regulators are designed to fit *any* mixing box.

high velocity air blender



Now your clients can offer complete air conditioned comfort, thermostatically controlled by the occupants to suit their individual needs. With a Honeywell Air Blender serving each room the whole system is always in balance despite widely varying room demands. Even unusual conditions—such as those caused by a building being shaded on one side and heated by the sun on the opposite side—will not upset the system.

Look at the advantages the Honeywell high velocity air blender offers you—

1. **"Dial" air balancing**—easy to balance system that enables the architect and engineer to make subsequent changes without disturbing the rest of the system, thereby eliminating a major disadvantage of conventional double-duct systems.
2. **Controlled volume of air**—from both hot and cold ducts independently, regardless of changing demands from other parts of the system—unlike conventional methods.
3. **Constant CFM from each unit**—means elimination of noise and draft problems created by changing flow.
4. **Long valve life**—gives lower maintenance costs because of absence of linkage.
5. **Simplified central system control**—a by-product of the other advantages because you don't need constant static system pressures.

For further information about Honeywell High Velocity Air Blenders and other Honeywell heating and air conditioning products, call your local Honeywell office or write Honeywell: Dept. HV-12-297, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

112 offices across the nation

First in Controls

Archbishop Thos. J. Walsh Homes. 13 buildings; 630 units.
Rev. William P. Hayes Homes. 11 buildings; 1458 units.
Otto E. Kertchner Homes. 8 buildings; 730 units.

Thousands of MARSH Valves and Traps for this big Newark project!

A bright spot in the dark clouds that overhang Humanity is America's big drive to solve the housing problems of congested cities.

The development pictured here is in Newark. It consists of four projects, comprising a total of 41 big buildings containing more than 20,000 rooms. The four developments provide about five rooms each for over 4,000 families—enough dwelling units to house the entire population of a city of nearly 20,000 people.

Naturally, in buildings like these it is necessary for the sake of initial economy to rule out frills and embellishments. But never forget that the vital need for long-range economy dictates *highest quality in every basic element of construction.*

That is why only the best heating equipment is used in the four big central heating systems. That is why the systems are equipped throughout with thousands of Marsh Radiator Valves and Traps—the kind that will stand up across the years.

Yes, in buildings of every size and kind you will find Marsh Valves, Traps and Vents . . . selected by men who know the economy of using only the best. Let the Marsh man work with you on your next job.

MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jas. P. Marsh Corporation* *Dept. U, Skokie, Ill.*

Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd St., Edmonton, Alberta

Newark's big scale housing

The four projects—three of them completed and fully tenanted—provide homes for 4,374 families in the 20,681 rooms of 18 12-story; 13 8-story, 1 7-story, and 5 3-story buildings. The project is described as:

Housing Authority,
City of Newark, N. J.
David Kent — Dir. of Development
Louis Danzig — Exec. Dir.
Steve Galaida — Mechanical Engineer

The projects are:

1. Otto E. Kertchner Homes
   General Contractor: HRH Construction Co., New York, N. Y.
   Heating Contractor: John H. Joyce, Newark, N. J.
2. Archbishop Thos. J. Walsh Homes
   General Contractor: Terminal Construction Co., Wood Ridge, N. J.
   Heating Contractor: John Cooney, Harrison, N. J.
3. Rev. William P. Hayes Homes
   General Contractor: Terminal Construction Co., Wood Ridge, N. J.
   Heating Contractor: Paramount Plbg. & Htg. Corp., New York, N. Y.
4. Christopher Columbus Homes
   General Contractor: Terminal Construction Co., Wood Ridge, N. J.
   Heating Contractor: Paramount Plbg. & Htg. Corp., New York, N. Y.

The Christopher Columbus group of 8 12-story buildings is not illustrated, but is now completed.

The great combination: Marsh packless—*truly packless*—radiator valve and the trouble-free Marsh thermostatic trap.

The Marsh float and thermostatic trap. There is a Marsh trap for every heating service.

MARSH *Quality Heating Specialties* **SINCE 1865**

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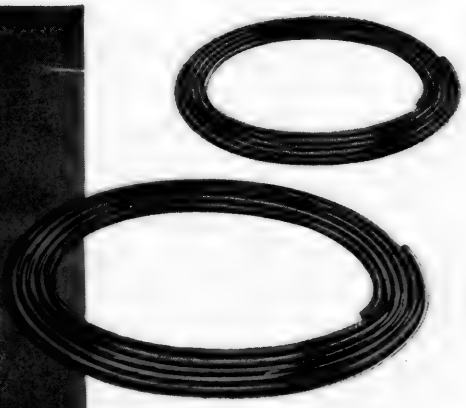

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...You'll always ask for it by Name!

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DENVER, COLO.
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CLEVELAND, OHIO
4615 Perkins Ave.

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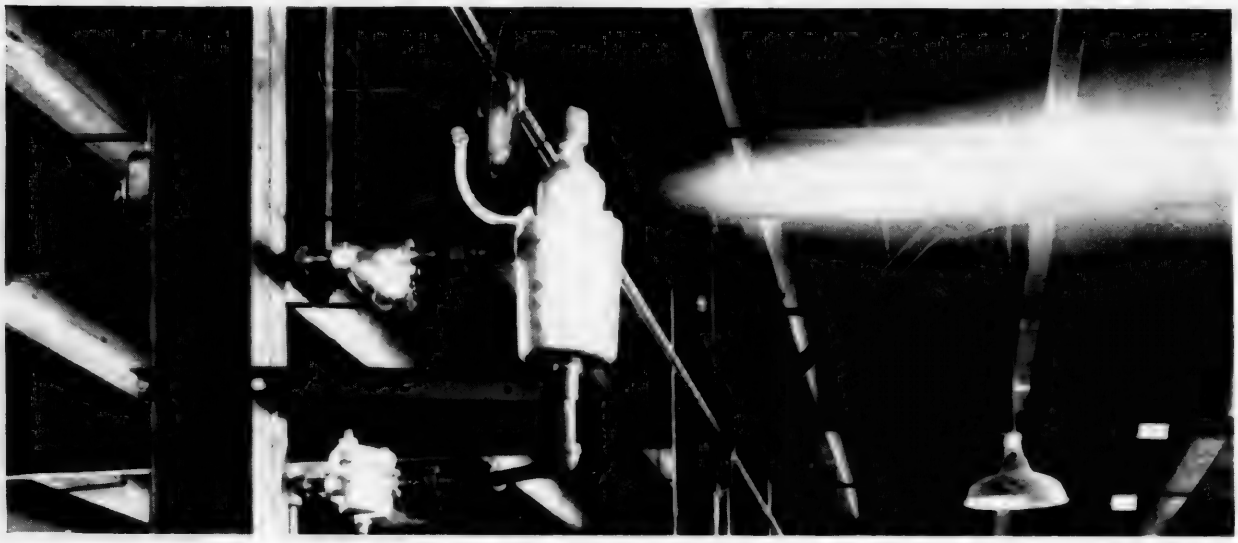
690 Murphy Ave.
S.W., Unit 5, Bldg. B

When You Want to Humidify—



Consider the Advantages of ARMSTRONG *Steam* Humidifiers —Easy to Install and Maintain . . . Automatic, Accurate Control

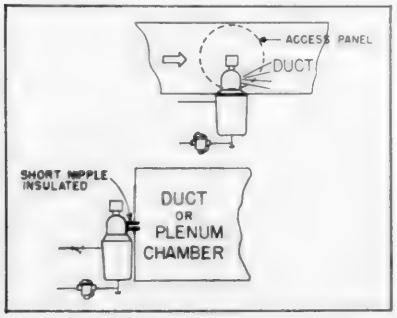
Whether you want to humidify an office for the health and comfort of employees, a rubber cement plant to prevent the hazards of static electricity, or a church to protect the pipe organ...Armstrong can help you do it better—and at less overall cost—with steam humidifiers.

They discharge steam directly into the room or into ducts or plenum chambers—either way you get large capacity at low cost. For explosive atmospheres, there are air-operated models. What's more, there's no mineral "dust" to settle onto employees and equipment.

Control is really accurate—relative humidity is held within 2 to 4% of setting. The steam disperses quickly and the sensitive humidistat responds quickly to slight changes in humidity.

Maintenance is almost a forgotten word with these units. There's nothing to clog the valve or scale up the inside. Solenoid coils are glass wound. Valves and humidistats last indefinitely; fan motor bearings are lubricated for life.

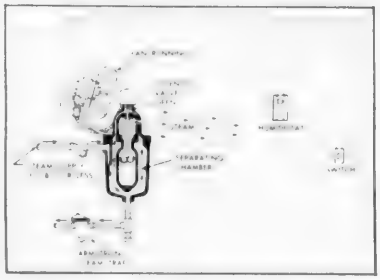
There are other advantages, too. No damp spots—the unit has a steam jacketed inner chamber which evaporates condensation; the steam carries no water droplets. Effect on air temperature is negligible. No odor—pure steam is odorless. Quiet operation—unit is acoustically designed.



BULLETIN No. 500
gives complete information. Tells:

- How relative humidity affects profits, health, comfort and safety.
- Why steam is best for humidification.
- How users of Armstrong Steam Humidifiers profit.
- How to select and install units.
- Complete physical data and prices.

Send for your free copy today! Call your local Armstrong Representative, or write:



HOW THEY WORK

When humidistat calls for moisture, solenoid steam valve opens and fan starts. Steam enters separating silencing chamber, then goes to atmosphere. When humidity reaches desired level, valve closes and fan stops.

NEW!

Automatic, controlled evaporative-type central humidifier

. . . the HUMID-I-MAKER

Air is blown across surface of heated water and into central duct. No mineral dust. High capacity. For use with hot water, steam and warm air heating systems — in homes, offices, greenhouses, schools, etc.

Bulletin No. 9001 gives complete information—write today.

ARMSTRONG MACHINE WORKS
846 Maple Street • Three Rivers, Michigan

SATISFACTION GUARANTEED

Does the guy still drive a 1930 auto?

What prompted this question was the third request in four days for repair parts for one of our good old 1930 boiler feeders . . . along with a nice letter telling us how it has served for all those 26 years.

Thanks for those kind words, friend contractor, but tell us: Hasn't that 1930 feeder earned retirement? Does its owner still drive a 1930 automobile?

We'll bet the owner of that feeder has had at least eight fancy motor cars in the past 25 years, and nearly as many refrigerators, dishwashers, toasters and other flashy automatic gadgets. But down in his basement, safely hidden from the scorn of his neighbors, is an assortment of heating equipment that would probably put an antique museum to shame!

Well, we realize that auto makers have a smart way of obsoleting their models almost before the paint is dry. But we're not suggesting *that* kind of pressure; we're just saying sell 'em a new one *when* they need it.

The owner of that 1930 feeder probably needs, not only a new feeder, but a whole new heating plant to go with it. You have people like him in your locality. Tell 'em and sell 'em what they need . . . NEW, doggone it, NEW! It's all right to "make '56 the year to fix," but let's not forget that

the best way to fix is to REPLACE!

McDonnell & Miller, *Inc.* 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

Strictly 1956 Models!

No. 47-2 *Feeder and Cut-off Combination*—for most automatically fired heating boilers operating at pressures up to 25 psi. Other types for larger boilers, higher pressures.

No. 150 *Pump Control, Cut-off, and Alarm Switch*—for boilers up to 150 psi. Also available with integral water column (No. 157). Other types for pressures up to 250 psi.

No. 67 *Low Water Cut-offs*—for all steam boilers with pressures up to 20 psi. Other types for hot water heating boilers, higher operating pressures.

230 Series *Btu-rated Pressure Relief Valves*—for hot water space heating boilers. Complies with ASME Boiler Code in every way; rated and certified by National Board.

McDONNELL *Boiler Water Level Controls*

Chase® Type L Copper Tube!

It's a sure thing! Your heating, air conditioning and refrigeration equipment will deliver dependable, *peak performance over the years*, when you fabricate with Chase Type L copper tube!

Inside and outside diameters accurate to thousandths of an inch assure proper tolerances for fitting connections. That means extra-easy assembly of finned sections. Smooth interiors of tube and Chase solder-joint fittings insure a steady, even flow of heating or cooling liquids. And for extra cleanliness, you can get Chase Type L copper tube tightly capped at slight extra cost.

Order Chase Type L copper tube, Chase extra-soft copper refrigeration tube and Chase wrought copper solder-joint fittings from the Chase wholesaler near you!

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IT'S SMALLER....IT'S LIGHTER **IT'S RIGHT FOR MODERN EQUIPMENT**

Type RK, Capacitor-start, ⅙ or ¼ hp.

the WAGNER "48"

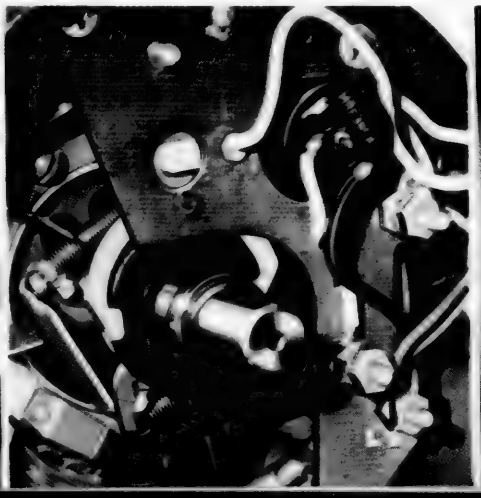
new fractional horsepower motor

Here's the 48 frame motor you've been looking for! The Wagner "48" comes with either resilient or rigid base ... capacitor-start or split-phase type. You get the standard 48 frame size—with from *three* to *eight* pounds less weight per motor than previous models in the same hp ratings! The Wagner "48" is easier to handle... to stock... to install. Yet it's packed with Wagner quality—a known value for more than 65 years.

MYLAR*-PAPER LAMINATED SLOT INSULATION combines top moisture resistance with high dielectric strength and thermal stability—gives the Wagner "48" more application versatility, longer life, when unexpected overloads occur. *DuPont trade mark.

QUICK BREAK SWITCH, that disconnects the starting winding and capacitor from the line at a predetermined speed, makes and breaks with minimum arcing —is dependable and trouble-free.

BABBITT LINED BEARINGS give *smooth* performance. They stand heavy pressures with low temperature rise, have superior anti-seizure and non-scoring characteristics, are corrosion-resistant.



ALL ANGLE OPERATION. You can mount the Wagner "48" at any angle. A new lubrication system assures positive protective lubrication in any position.

LIGHT WEIGHT STEEL FRAME, precision-machined for accurate endplate fit, combined with CAST ALUMINUM ENDPLATES, gives the "48" strength with light weight.

EASY TO CONNECT. Just loosen one screw for access to terminal board. **EASY TO SERVICE** . . . no need to disconnect leads when removing endplates.

solves problems for the design engineer

For design engineers who've been looking for light weight, fractional horsepower motors with less bulk—here's good news!

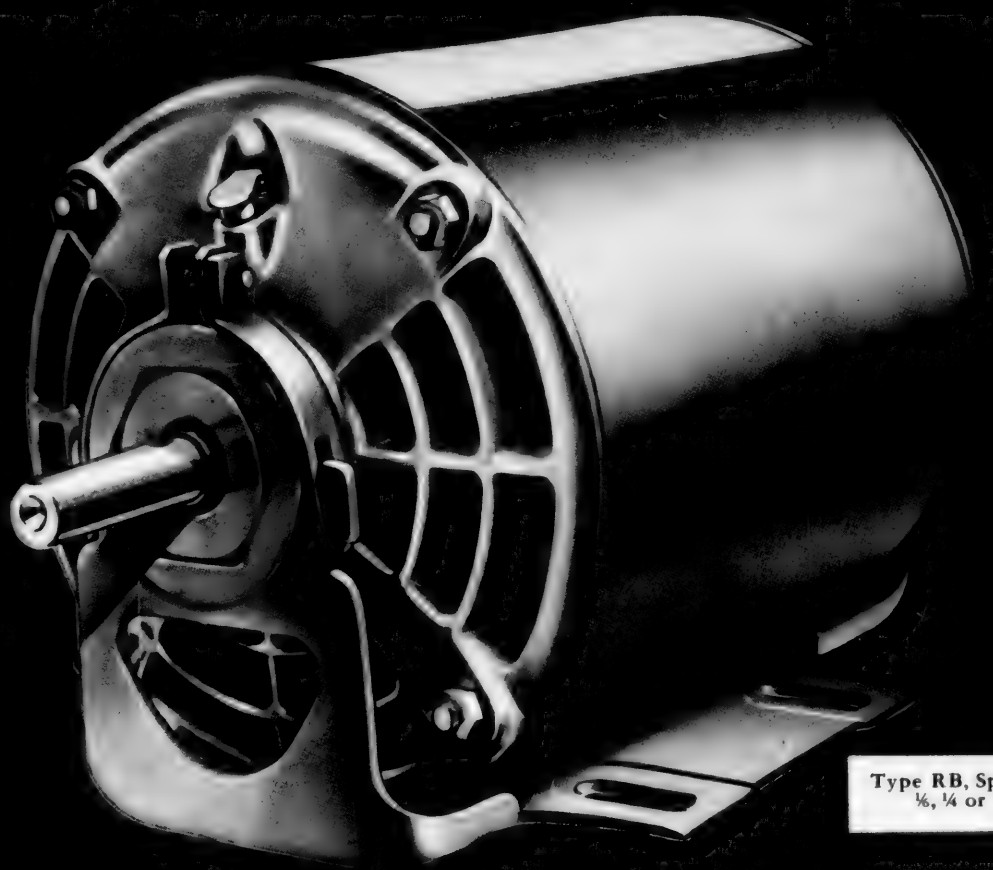
Wagner "48" capacitor-start or split-phase motors are rugged enough to permit direct mounting, are compact enough to fit in tight spots, are exceptionally light in weight, and operate efficiently when mounted at any angle. Both types are available with resilient bases or with rigid bases that are *welded* to the steel motor frames to provide great strength. Through ventilation assures cool running motors that last longer.

If you would like to test the new Wagner "48," one of our field engineers will be glad to furnish a sample motor. Contact the Wagner Branch near you or write us.

WAGNER ELECTRIC CORPORATION . . . 6400 Plymouth Avenue, St. Louis 14, Missouri

M56-16

the WAGNER "48"



Type RB, Split-phase, ⅙, ¼ or ⅓ hp.

JENKINS Fig. 106-A

The FIRST
Renewable Composition Disc
BRONZE GLOBE VALVE
150 lbs. Steam 300 lbs. O.W.G.
⅛ in. to 3 in.

Making a Work Horse a Champion

Take a Fig. 106-A apart. It's easy to see the reason why it's the "champion" of disc-equipped Bronze Globes. Every part, from heatproof handwheel to pipe ends, reflects the design and construction skill of generations of Jenkins Valve specialists.

Jenkins Bros. introduced the first renewable composition disc Globe . . . is still the only manufacturer of both valves *and* discs.

Fig. 106-A not only looks better — it proves out better in performance. In any comparison, its long-life, low-upkeep record has always set the standard. That is the true measure of valve cost — and it is the reason why industry's shrewdest buyers will settle for nothing less than Fig. 106-A quality.

The Fig. 106-A "family", with interchangeable parts, provides Globe, Angle, and Check patterns to meet 90% of average valve needs.

Ask your Jenkins Distributor for full information, or write: Jenkins Bros., 100 Park Ave., New York 17.

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VALVES
SINCE 1864 TRADE JENKINS MARK
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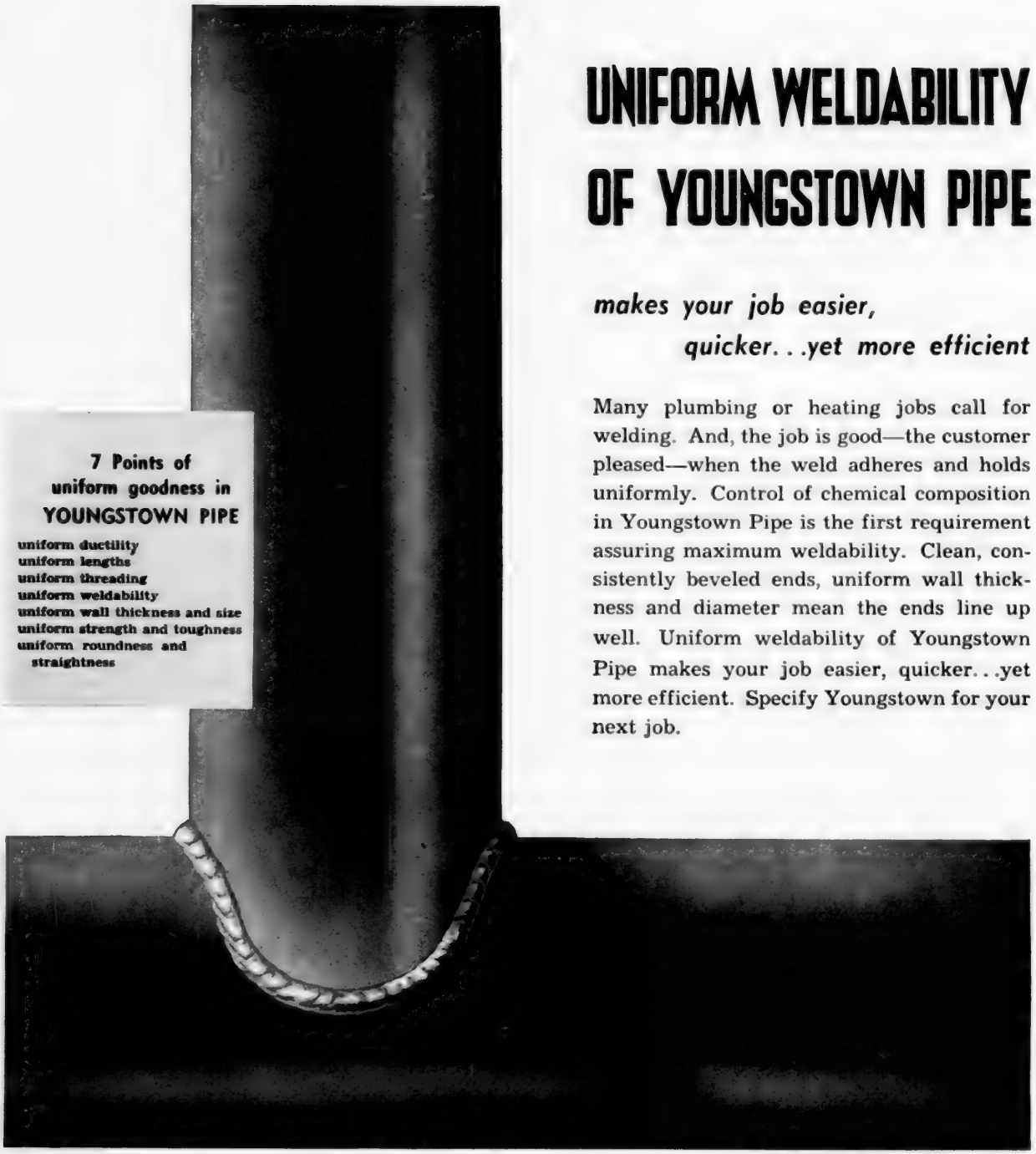

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makes your job easier, quicker. . .yet more efficient

Many plumbing or heating jobs call for welding. And, the job is good—the customer pleased—when the weld adheres and holds uniformly. Control of chemical composition in Youngstown Pipe is the first requirement assuring maximum weldability. Clean, consistently beveled ends, uniform wall thickness and diameter mean the ends line up well. Uniform weldability of Youngstown Pipe makes your job easier, quicker. . .yet more efficient. Specify Youngstown for your next job.

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Prepared by the Engineering Department of Tuttle & Bailey, New Britain, Connecticut

Proper Methods of Dampering

It is impractical to design a duct system accurately enough so that no balancing will be required. It is also impractical to design an air distribution outlet that will not require balancing. Therefore in an air distribution system, it is necessary to use dampers to balance shorter lengths of ductwork against the duct having the longest equivalent length of run.

Dampers for Grilles

Figure 1 shows several common types of dampers and the distribution of air over the face of the grille which they provide. Type A is a quadrant-operated blade-type damper. It is apparent that in the partially-closed position the air must pass adjacent to the side-walls of the duct itself, and if there is insufficient length between the damper and the grille, the air does not have an opportunity to re-expand to distribute itself over the entire grille face. Therefore the effective area of the grille is reduced.

Type B, a two-blade opposed-acting damper, confines the air stream to a single jet when the damper is modulated toward the closed position. This produces improper distribution at the grille because the stream has insufficient opportunity to expand. There is also a mistaken conception that when this damper is moved toward the closed position, it will reduce the effective area of the grille in such proportion that the same throw is maintained for a smaller quantity of air. Since the throw varies inversely as the square root of the effective area of the grille, this cannot be true.

Type C is a multi-louvre damper that tends to segregate the air into smaller jets than either Types A or B. The expansion distance on the leaving side of the damper need not be as great as with the other two styles. Therefore the grille more nearly fills with air. In this respect this damper is superior to the previous types. However, the damper has the inherent fault that, as it is adjusted toward the closed position, the angle of air discharge from the grille is affected. On large size dampers it is difficult to lift the entire weight of the blades by means of an operator, and the force exerted by the air stream on the blades is unbalanced.

Perhaps the best type of damper is the opposed-blade damper, Type D. Each blade is center-pivoted. The forces acting on either side of the pivot point are equal and the force necessary to operate the damper from a closed to an opened position is only that required to overcome the friction of the operating mechanism of the device. Each blade moves toward the adjacent blade when closing and creates a series of small jets which join quickly and more nearly fill the grille.

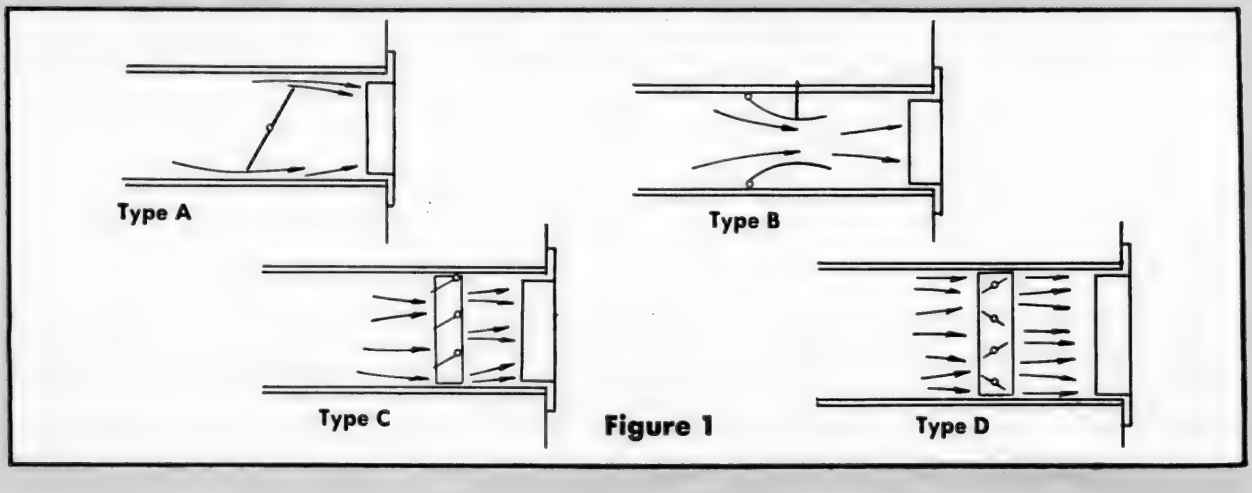


Figure 1

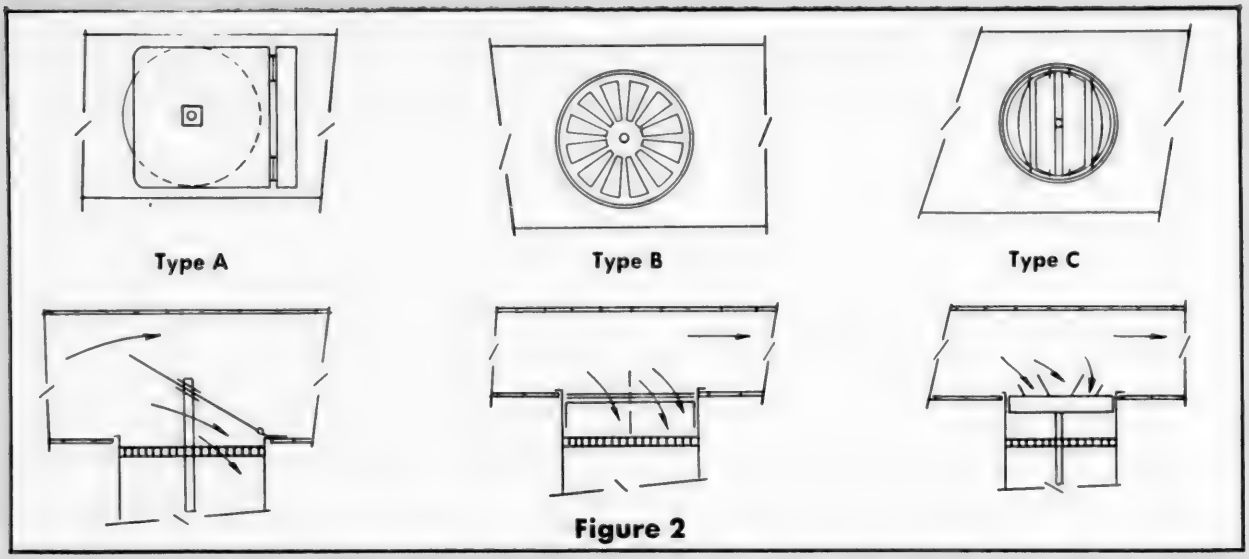


Figure 2

Dampers for Ceiling Diffusers

Figure 2 shows several types of dampers for use with ceiling diffusers. Type A is a so-called "splitter damper." While easy to construct, it causes the air to pile up on one side of the diffuser and prevents equal distribution around the entire 360° periphery. A distribution grid should always be used with such dampers to equalize air flow. When in the open position, the damper narrows the available duct area with which to pass air on to subsequent diffusers.

Type B, a sliding-plate damper is composed of three sections of plates stamped with identical slots. When these slots are aligned, the damper is in its maximum open position, and as the plates are moved toward the closed position, the slots are restricted. This damper causes jets, but the jet areas are small and, therefore, the expansion distance required is much less than in the case of Type A.

Type C is a multi-louvre circular damper contained in a framework which tends to straighten the air on the leaving side of the damper blades. Friction devices prevent the damper blades from changing position, regardless of air pressure. This type of damper acts to equalize the air flow at any damper position.

General Application Data

In an open position, dampers should have an effective area equal to, or greater than, the air distribution devices they serve. If the damper has less effective area in its open position than the air outlet, and is coupled with the outlet, high velocity jets will occur, resulting in an outlet not completely filled with air. Thus, the jet velocity through the diffuser will be dictated by the area of the damper itself. The throw of the air stream will consequently be longer than desired and the total pressure required in the branch duct will be considerably increased.

It is difficult to balance a system with the grilles or diffusers removed. Therefore, any dampering device should be provided with an operative means accessible from the face of the grille or diffuser.

As much distance as possible should be left between any damper and its air outlet to allow full jet expansion to take place, and air straightening devices should be used where insufficient distance is available.

If you have a specific problem involving air distribution, Tuttle & Bailey's Engineering Department will welcome the opportunity to be of help. Address: Engineering Department, Tuttle & Bailey, New Britain, Connecticut.

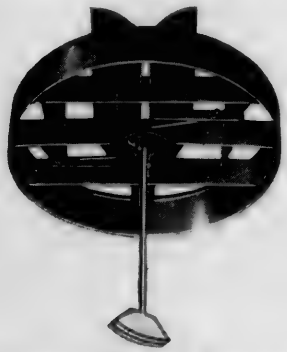
Tuttle & Bailey Dampering Devices
. . . *make system balancing easier!*

Dampers for use with Grilles:

Vectrol consists of a series of curved blades attached to a frame which pivots on a mounting bracket. The blades operate as a unit and will maintain any desired setting regardless of the system pressure.

VC-7 Opposed Blade Volume Control, furnished as an integral part of T&B registers, is also available as a separate device for installation behind grilles. Opposed blades provide positive setting from fully open to fully closed.

Dampers for use with Ceiling Diffusers:



No. 4 Volume Control Damper provides a convenient and accurate method of regulating the volume of air discharged from T&B diffusers. The damper blades divide the air stream into small segments which minimize turbulence and result in quiet operation.

No. 6 TFD Volume Control Damper is a simplified, adjustable damper designed for use where close-coupled connections are required.

For catalogs on the above T&B Dampers — and the complete line of T&B Air Distribution Devices, write —

TUTTLE & BAILEY

division of Allied Thermal Corp. New Britain, Connecticut

A complete line
of air distribution equipment and accessories
for low and high pressure systems

AIRCOUSTAT* sound traps layout for controlling

AIRCOUSTAT SILENCES ALL FREQUENCIES IN THE AUDIO-FREQUENCY RANGE
Resonators hold low-frequency sounds
Periodic internal structure dampens middle-frequency noise
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simplify design and air conditioning noise

THIS 5-FT. AIRCOUSTAT REPLACES 80 FEET OF ORDINARY DUCT LINING

AIRCOUSTAT saves you time on the job because it's pre-engineered . . . and fits acoustically if it fits geometrically. AIRCOUSTAT is quick and easy to install . . . no special tools are required.

Most Efficient Solution

AIRCOUSTAT's power to deaden sound is unmatched by other sound control methods devised for air conditioning systems. Acoustical performance is *guaranteed*. Efficiency is more than 13 times that of ordinary lining. And AIRCOUSTAT provides a lower flow resistance and less pressure drop than other sound control methods.

AIRCOUSTAT suppresses sound in low-velocity air conditioning systems . . . will silence an entire system or selected outlets. AIRCOUSTAT units fit any size of duct within the range of unit sizes . . . adapt themselves to any shape of duct.

Cost You 50% Less

AIRCOUSTAT units cost you as much as 50% less than ordinary duct lining . . . with savings in time and labor costs. AIRCOUSTAT is quick and easy to install . . . no special tools are required. You can ship ducts nested together and store them outside on the job site.

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AIRCOUSTAT eliminates noise in a wide range of applications: general and private offices, conference rooms, sleeping quarters, and recording studios.

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Koppers' amazing new AIRCOUSTAT is the product of years of experience in designing sound control installations for aviation and other industries. Jet engine housings, machine enclosures, sound barriers and traps, sound-proof foremen's offices—these are only a few of the many sound control devices created by Koppers Industrial Sound Control engineers. Koppers has put this engineering "know-how" to work silencing air conditioning noises more effectively . . . more economically than was ever before possible . . . saving you time and costs.

For more details, write to KOPPERS COMPANY, INC., Industrial Sound Control Dept., 6312 Scott Street, Baltimore 3, Maryland.

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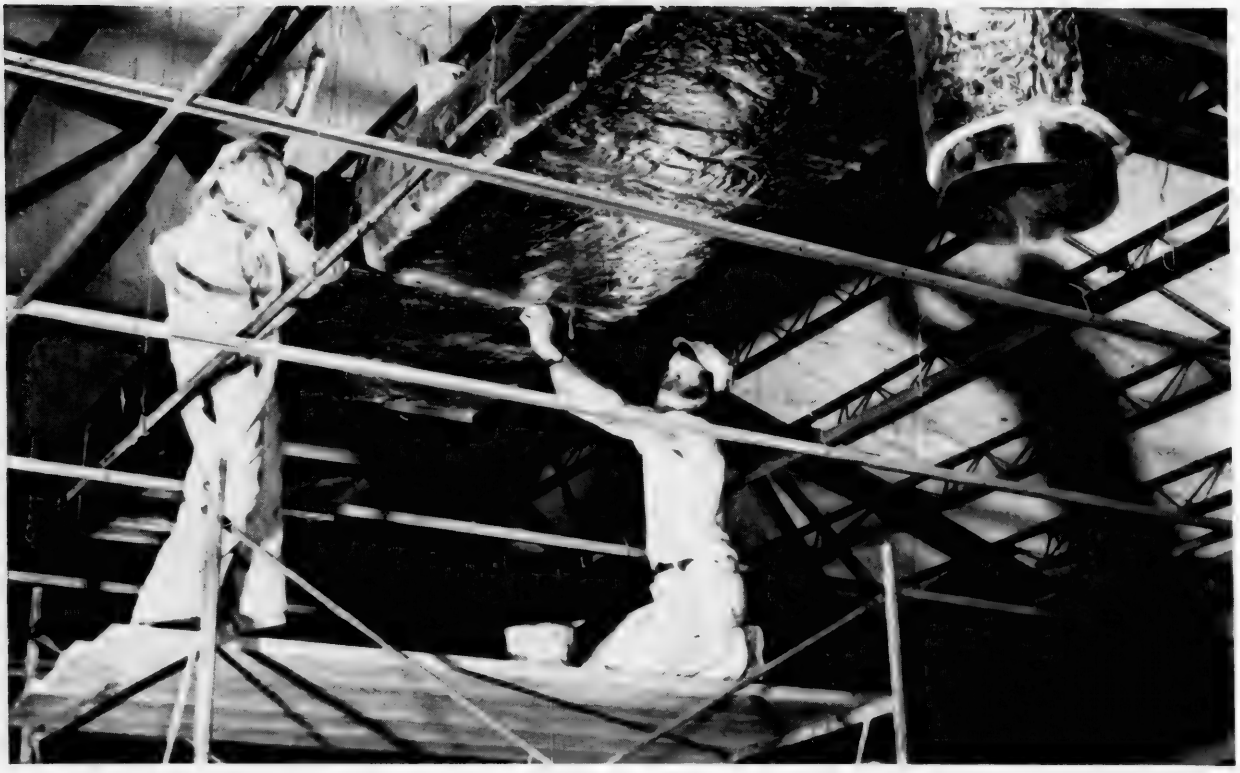
INSULATION News from L·O·F GLASS FIBERS COMPANY



"Foil-faced Microlite cuts installation costs . . . boosts insulating efficiency"

—says John Hayes, Service Products, Inc., Toledo, Ohio.

Service Products, Inc., used foil-faced Microlite to prevent condensation on sheet metal air-conditioning ducts in Toledo's University Bowling Alleys. Working on scaffolds, the men brushed adhesive on ducts where edges of insulation butted together, and sealed the handy attached 2" tabs with adhesive . . . all more quickly than is possible with other blanket-type insulating materials!

Look at all the dollar-saving advantages you get from Microlite . . .

- *Easy to handle on scaffolds*—extremely light in weight!
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- *Resists tearing*—high tensile strength allows workmen to pull it through tight spots safely!
- *Economical to store*—compression-packed rolls take up a fraction of the space of ordinary insulations.

Microlite is one of the most effective insulations known. It is made from countless fine glass fibers which form millions of sound- and heat-trapping air cells. What's more, these glass fibers won't rot or burn!

Microlite is available with foil, vinyl and other plain or reflective facings, extended beyond edges of insulation to form tabs. For full details, check the Yellow Pages for the nearest distributor; or write: L·O·F Glass Fibers Company, Dept 63-126, 1810 Madison Avenue, Toledo 1, Ohio.

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L·O·F GLASS FIBERS COMPANY

TOLEDO 1, OHIO

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Copeland's new 270,000 sq. ft. plant on a 75-acre tract in Sidney, Ohio, opens a new era for Copeland, its dealers and wholesalers. Enlarged and modernized facilities will provide more efficient service for our customers.

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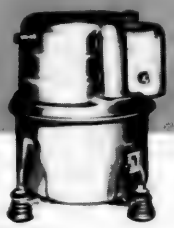

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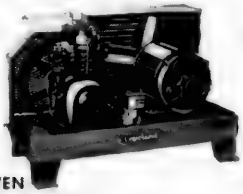
Heavy-duty performance at low current consumption.



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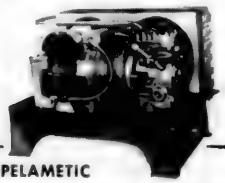
Superior—engineered for every refrigeration need.



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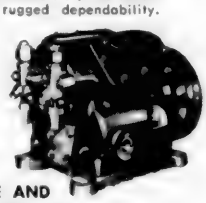
the accessible hermetic . . . The industry leader for rugged dependability.



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Designed for the critical needs of truck and auto air conditioning and refrigeration.

Copeland's 38-year history is one of constant growth.

Our handsome new plant is only another step in a progressive tradition begun years ago. The bright future for air conditioning and refrigeration is opening up now . . . and the entire Copeland family—company, dealers and wholesalers—is ready with new facilities, new models and a new distribution policy geared to provide the kind of service that assures profitable business for all.

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PLAN FOR THE FUTURE—come to Chicago! New ideas and new developments—the latest advances in all phases of heating, ventilating and air conditioning will be on view to you for full five days. At the largest exposition of its type in the world, you will get the latest *first-hand* information from more than 450 exhibitors and their technical representatives. It's information that means personal profit to you, whatever your special interests—industrial, commercial or domestic installation—they will all be on show at Chicago!

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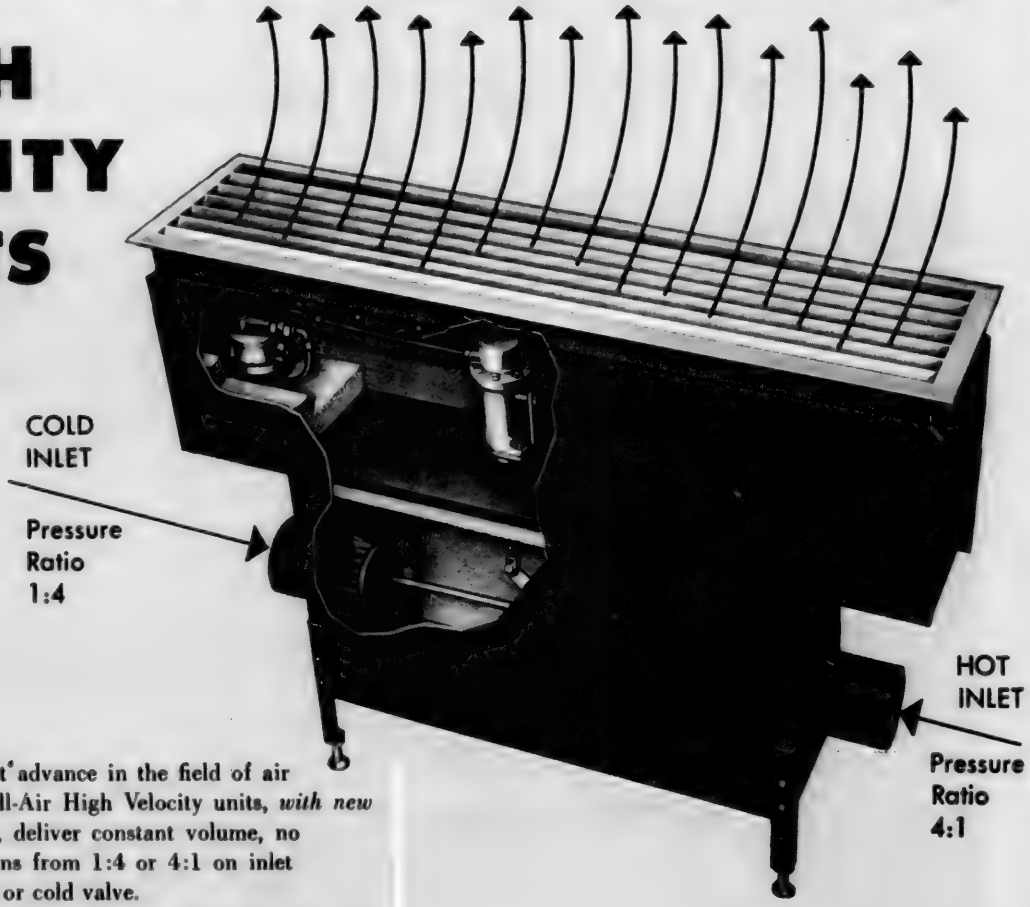
CONSTANT VOLUME

HIGH VELOCITY UNITS



Here is a vitally important advance in the field of air distribution. Anemostat All-Air High Velocity units, *with new simple automatic controls*, deliver constant volume, no matter what the fluctuations from 1:4 or 4:1 on inlet pressures of either the hot or cold valve.

Each unit is a single package including the controls and integral thermostats if required. There is complete accessibility of all controls through removable diffusers. No access panels are required. Capacities of CONSTANT VOLUME units can be pre-set at the factory.

These Anemostat CONSTANT VOLUME units

- Assure scientific draft-free distribution of air.
- Are available in 100% induction units.
- Include Anemostat die-cast metal rocket-socket valves. More than 50,000 of these valves are in service, and not a single one has needed maintenance.
- Operate on standard 15 lb positive acting compressed air systems.

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Comfort story of a modern restaurant

Honeywell Electronics makes operation of small-

Bob's No. 3 Restaurant, Glendale, Calif. Architect: S. David Underwood, A.I.A. Designer and contractor: Don C. Glenn Heating & Air Conditioning Co.

Attractive, modern—Bob's No. 3 Restaurant typifies the kind of short-occupancy space where the accuracy and fast response of Honeywell Electronic Temperature Control are ideal for keeping comfort constant. Here are other major advantages of the installation:

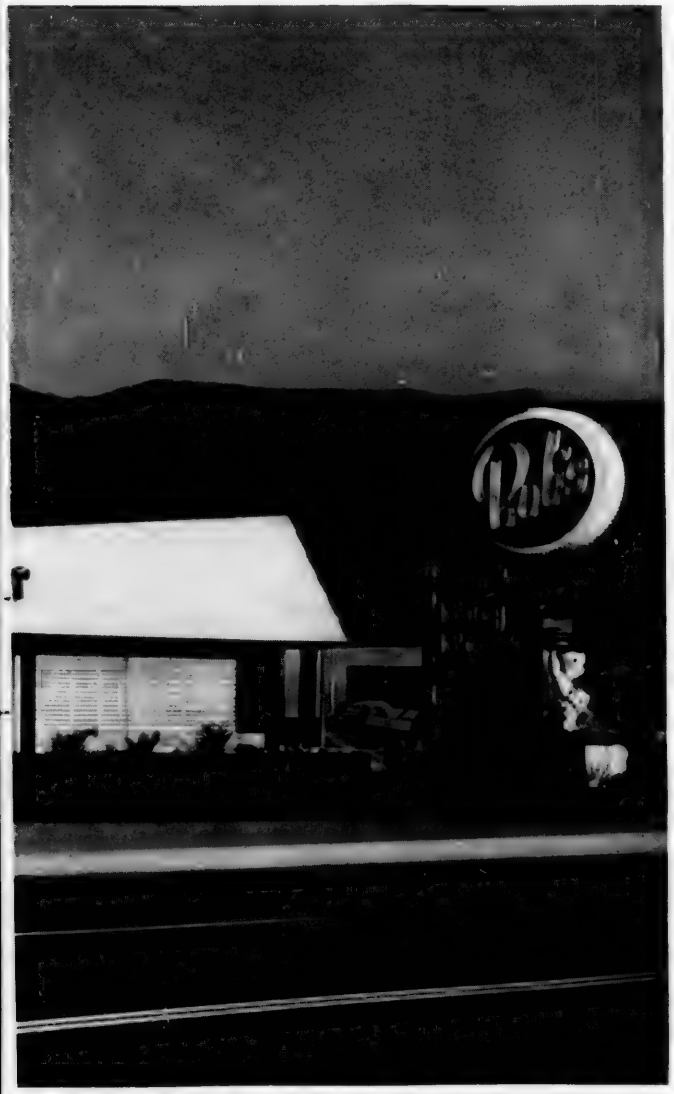
. . . ***automatic change-over*** from heating to ventilation to cooling, without attention.

. . . ***outdoor thermostat*** automatically adjusts indoor temperature according to the weather, winter and summer. Permits ideal comfort in mild weather, prevents unpleasant indoor chilling in hot weather.

. . . ***electronic control panel,*** conveniently located, gives restaurant manager full control of temperatures and avoids tampering.

. . . ***automatic use*** of outside air for cooling whenever conditions permit lowers cost of mechanical refrigeration and gives free cooling during mild weather, or occasional unseasonal winter warm spells.

system air conditioning fully automatic



Now smaller jobs can have big-system flexibility, convenience, operating efficiency at reasonable cost—with Honeywell Electronic Temperature Control

IN SMALL air conditioning systems, as in the largest, good control is essential to good performance.

Good control means fully *automatic* control—until recently limited mostly to systems in larger buildings. The small job simply couldn't justify the expense of a completely automatic conventional control installation.

That's no longer true, thanks to Honeywell Electronic Temperature Control. Now it's possible for buildings like this smart new restaurant in Glendale, Calif., to have the *best* control—and therefore ideal air conditioning performance—at a sensible price.

Honeywell Electronics gives the restaurant management the convenience, economy and comfort of a fully automatic, year-round heating and cooling plant. The features that make such benefits possible are explained in the picture caption above.

There are many ways Honeywell Electronics can help you give your clients unprecedented advantages—in heating, ventilating, air conditioning and industrial control, in any building, new or existing.

Call your Honeywell office for the new booklet that tells more fully how to apply electronics to your clients' control problems—and for information on the economical Honeywell Periodic Maintenance Plan. Or write Honeywell, Dept. HV-12-151. Minneapolis 8, Minn.

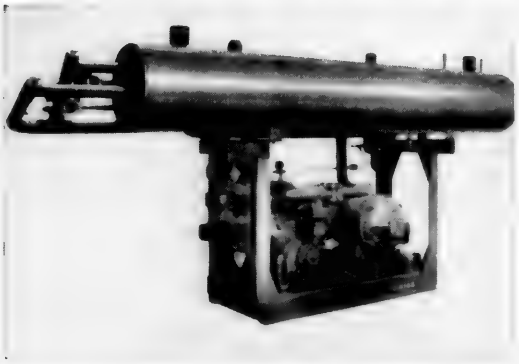
MINNEAPOLIS **Honeywell**

Electronic Controls

For further information about Honeywell products, check the heating and air conditioning section 29 i/ Mi of Sweet's Catalog

112 offices across the nation

Florida motel orders "seconds" on Worthington air conditioning



Low-cost operation of Worthington packaged liquid chillers stems from exact matching of capacity control to load requirement. Easy installation, long life and wide selection are other key features.

Providing an attractive climate indoors and out has paid off so well for the Azure Tides Motel that they're adding a second building.

The cool, comfortable indoor climate is provided by Worthington's 25-ton packaged chiller (at left) and 15-ton condensing unit. So sold on Worthington air conditioning are the Azure Tides people that the new structure will be cooled by a second Worthington central system consisting of a 25-ton package chiller and a 15-ton condensing unit.

Located on Sarasota's Lido Beach, this handsome two-story motel owes its growing popularity to a choice location, modern comfortable appointments and service geared to the guests' convenience.

Both the original 50-unit building (above) and the 38-unit addition (three-story construction with elevator, modern restaurant and cocktail lounge) were blueprinted by Designer Frank C. Martin and built by General Contractor Charles Ongheri of Sarasota.

For information on air conditioning units to meet your residential, business or industrial needs, call your local Worthington distributor. Or write for Bulletin WP-1099 B48 to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.6.70-R, Harrison, New Jersey. A.6.70

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CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

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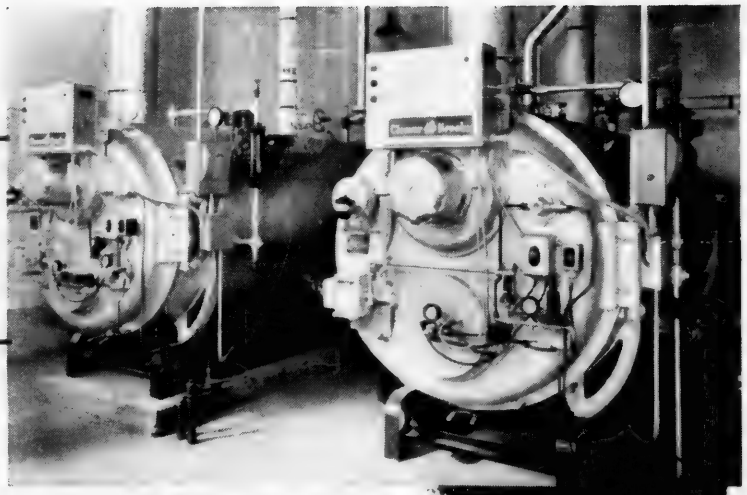
110 models
15 to 600 hp



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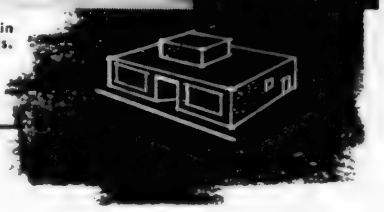

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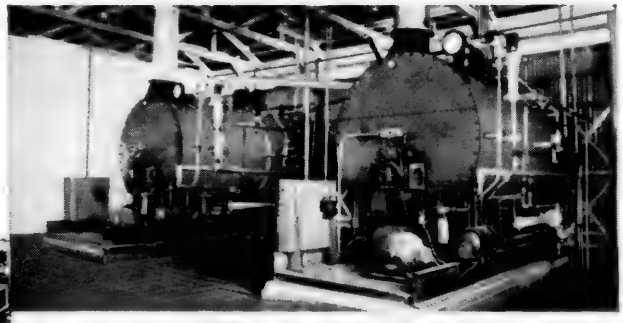
the broadest line of cost-saving "packaged" boilers—for hundreds of applications



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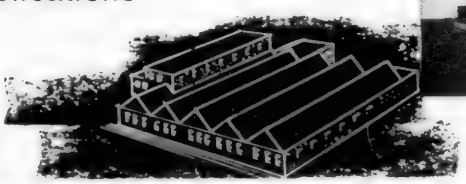
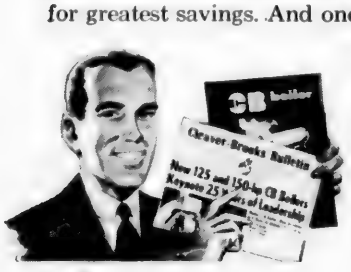


THE two installations above are representative of Cleaver-Brooks' broad range of standard models. The wide choice makes planning and selection of a boiler for your specific needs — large or small — a simple, time-saving procedure.

Your nearby Cleaver-Brooks representative, with years of specialized boiler experience, can be of real service to you. Working with you and your engineers, he can help you to find ready answers to questions of size, loads, present and future steam or hot water needs, space and equipment arrangement. Where local conditions dictate, oil, gas or combination oil/gas firing can be selected for greatest savings. And once installation is completed, arrangements are made for factory-supervised starting and training your operator.

Keep in mind, too, the many fuel and maintenance-saving advantages of four-pass design with forced draft . . . the standard equipment electronic combustion controls which assure continuous, safe operation.

Cleaver-Brooks boiler owners enjoy all these advantages and share in the combined application engineering experience of more than 19,000 individual boiler installations. Put this experience to work for you. Cleaver-Brooks Company, Dept. P, 314 E. Keefe Ave., Milwaukee 12, Wis., U.S.A., Cable Address: CEEBEEWEST — all codes.



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uni-flo

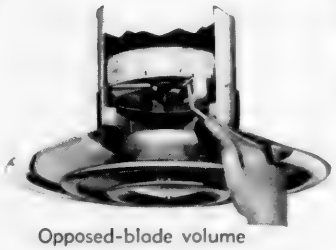
Engineered
Air Distribution

Get *Guaranteed* performance with Venturi-Flo ceiling diffusers

BARBER-COLMAN 1020 MODEL JS VENTURI-FLO
VELOCITY-TEMPERATURE TRAVERSE THROUGH VERTICAL PLANE

A Vel-Temp.		B Vel-Temp.		C Vel-Temp.		D Vel-Temp.		E	F Vel-Temp.		G Vel-Temp.		H Vel-Temp.		I Vel-Temp.		
30	73.0	55	71.5	55	70.8	55	70.4	25	72.0	70	69.3	55	70	55	70	30	71.5	9'-6"
40	71.2	25	72.0	30	72.5	30	72.5	25	72.0	25	72.0	35	71.5	30	71.6	35	71.5	7'-5"
30	71.5	25	72.3	25	72.0	25	71.9	40	71.9	30	71.9	30	72.0	30	72.2	30	71.9	5'-0"
40	72.2	35	71.9	35	72.2	30	72.0	35	72.0	35	72.0	30	72.5	35	72.0	50	71.9	2'-6"
50	72.5	60	71.5	45	71.2	45	71.5	30	72.0	45	72.9	50	72.5	40	72.9	50	71.9	6"

SUPPLY AIR VOLUME — 545 CFM
SUPPLY AIR TEMPERATURE — 51.8°F
AVERAGE ROOM AIR TEMPERATURE — 72.0°F AT THE 5' LEVEL



Opposed-blade volume control is easily operated through face of diffuser.

Simple adjustment provides air patterns from horizontal to vertical.

The uniform, draft-free air distribution pattern charted above is typical of the results you can predict with Venturi-Flo Ceiling Diffusers. With Venturi-Flo, the mixing of primary air with room air takes place throughout the entire length of the throw. This permits even higher temperature differentials than shown in the traverse above. Barber-Colman guarantees performance of Venturi-Flo Ceiling Diffusers when they are used according to published data. Contact your nearby Barber-Colman field office or write . . .

Barber-Colman Company

DEPT. L, 1102 ROCK STREET, ROCKFORD, ILLINOIS, U. S. A.

SKIDMORE PUMPS have set a standard for performance and dependability since 1921

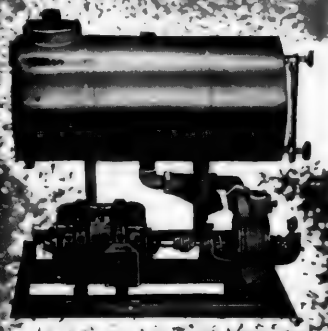
SPECIFY WITH CONFIDENCE

There's a Skidmore Pump designed for each and every heating requirement.

Write for bulletins

TYPE "CVS"

New, wider range of discharge pressures—from 10 to 40 lbs. Capacities range from 500 to 10,000 sq. ft. E.D.R.

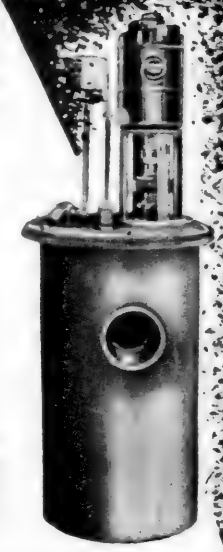


TYPE "TM"

Completely assembled on either steel or cast iron base—capacities, for boiler up to 250 H.P., with discharge pressures to 150 lbs.

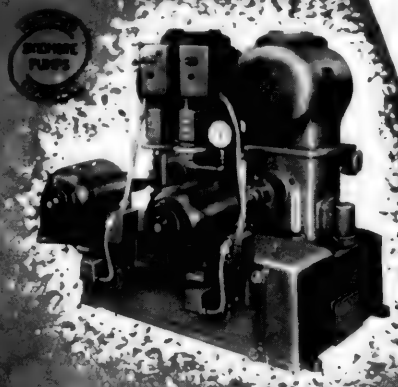
TYPE "HS"

Sturdily constructed for dependable service at small investment—capacities, 1,000 to 65,000 sq. ft. E.D.R., discharge pressures from 10 to 75 lbs.



VACUUM TYPE

Automatically adjusts itself to the varying conditions of the system. Efficiency maintained. Capacities ranging from 5,000 to 100,000 sq. ft. E.D.R.



TYPE "UV"

Designed for low return installations—capacities, 2,000 to 40,000 sq. ft. E.D.R. and discharge pressures from 10 to 75 lbs.

Send Coupon For Bulletins

SKIDMORE CORPORATION
ST. JOSEPH, MICH.

SKIDMORE CORPORATION, ST. JOSEPH 11, MICHIGAN

Please send bulletins on the following (pumps checked below).

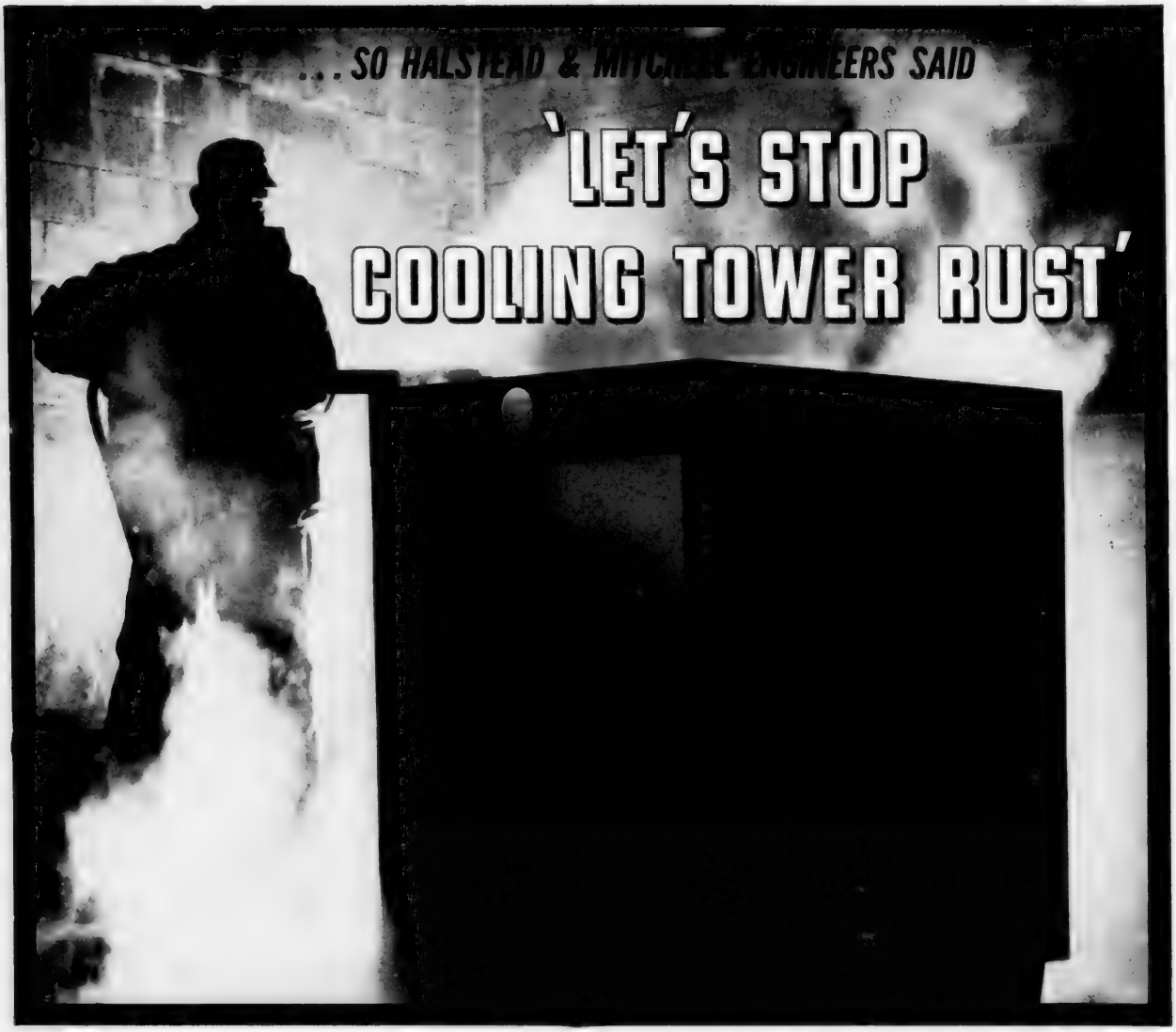
CVS TM HS UV VACUUM

Name .....

Firm .....

Address .....

City ..... State .....



The man shown above is using live steam to remove every vestige of dirt and scale prior to applying Halstead & Mitchell protections which withstand both rusting and *all* present day water treatments normally recommended for cooling towers and condensers. These unusual protections are used *only* on Halstead & Mitchell's Cooling Towers.

First protection is Vinsynite. Vinsynite works twice—it phosphates the metal, stopping rust dead in its tracks, and it forms the perfect adhesive base for paint coats to follow.

Vinyl Zinc is then applied, and vinyl paints have made their reputation because they are tough, flexible, inert and water resistant. Water vapor is locked out as the Vinyl Zinc locks to the underlying Vinsynite.

Third protection is chlorinated rubber, a paint which forms a thick film. Adequate film thickness is important when contact with water and high humidity is unrelenting, as in cooling tower service. Chlorinated rubber is also noted for its toughness and water resistance.

Halstead & Mitchell protections are more than painted on. They are hydraulically forced into every nook and cranny of every Halstead & Mitchell Cooling Tower so that no spot can ever be left unprotected as a starting point for rust. The combination of heavy film, vapor seal, toughness and tremendous adhesion offer protection against corrosion matched by no other manufacturer.

Want Details on the Widest Selection in Cooling Towers?

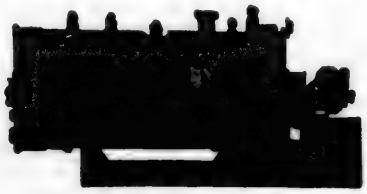
COMMERCIAL · INDUSTRIAL · RESIDENTIAL · TAKE-APART · CENTRIFUGAL

Write Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.
Or See Your Leading Wholesaler

HM
Halstead & Mitchell

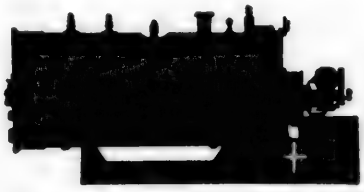
WOOD ROTTING, TOO, CAN BE STOPPED! **We do more than praise the long life of wood used in our wetted decks—we are the only manufacturer who offers a 20-Year Guarantee on wetted deck wood against rotting or attack by fungus!**

HOW SUPERIOR SOLVES YOUR STEAM PROBLEMS



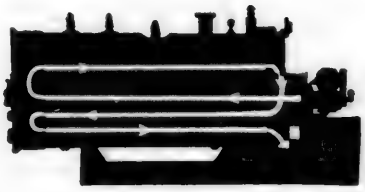
A COMPLETE PACKAGE

Completely factory-assembled and tested, a Superior Steam Generator is backed by undivided responsibility.



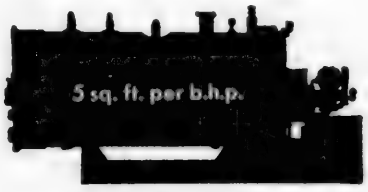
INDUCED DRAFT THAT'S BUILT-IN

...eliminates need of an expensive chimney... Multiple fans draw evenly on all tubes, reducing maintenance.



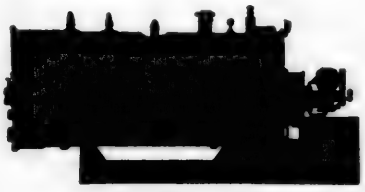
4-PASS, DOWN-DRAFT DESIGN

High gas velocities produce high efficiency. Down-draft design promotes rapid evaporation, quicker steaming.



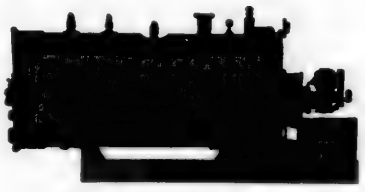
AMPLE HEATING SURFACE

A minimum of 5 sq. ft. of heating surface per boiler horsepower assures maximum efficiency at full rated capacity.



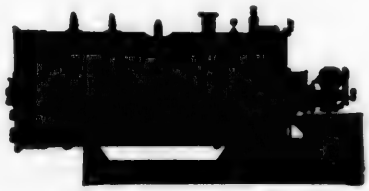
RESERVE CAPACITY

Greater steam space and large evaporating surface provide ample reserve capacity & better than 99% dry steam.



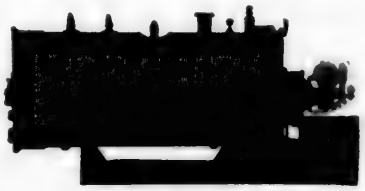
NO EXPENSIVE FOUNDATION

Built on a rigid channel iron base, a Superior Steam Generator needs only a floor capable of supporting its weight.



BUILT-IN CONTROLS

All controls essential to completely automatic operation are factory-wired into an easily accessible control panel,



BURN OIL, GAS, OR BOTH

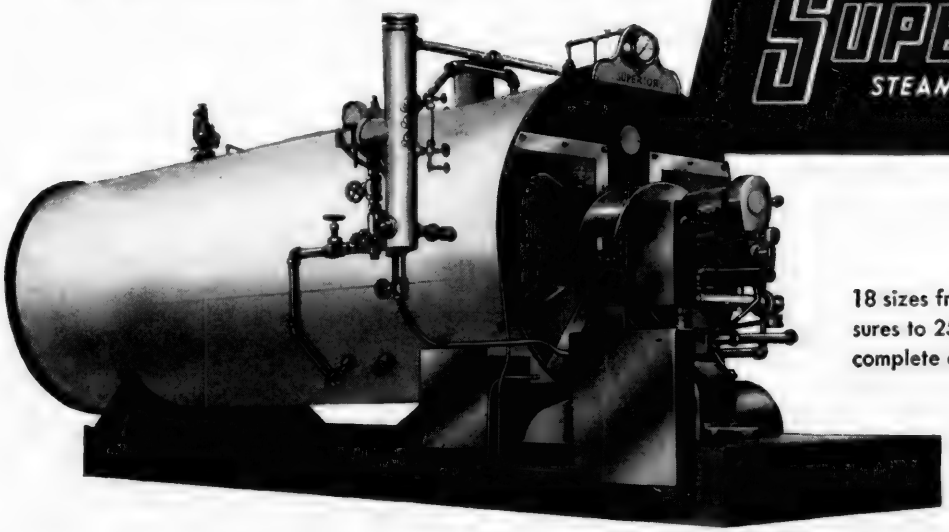
Superior Burners burn oil or gas or a combination of both... changing from one fuel to the other in seconds.

Superior Steam Generators are the ideal choice for a new steam plant... the simplest answer to expanding your present plant... the easiest solution to replacing obsolete boilers.

Guaranteed to develop maximum rated capacities at thermal efficiencies in excess of 80%, their design embodies features which insure long-lived dependability and maximum fuel economy.

for performance you can ***BANK*** *on*

SUPERIOR
STEAM GENERATORS



18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 819.

SUPERIOR COMBUSTION INDUSTRIES INC. TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

ALLEN-BRADLEY *Motor Controls and Accessories for Refrigeration and Air Conditioning*

Bulletin 709 Across-the-Line Starters

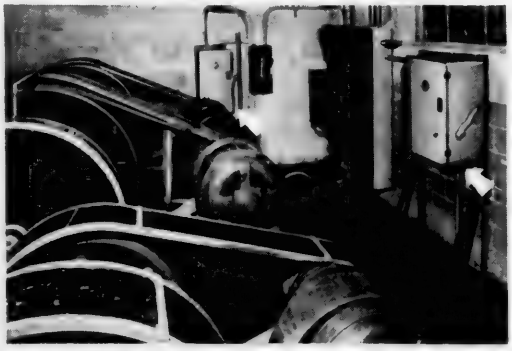
Bulletin 837 temperature control

Bulletin 712 Combination Starters

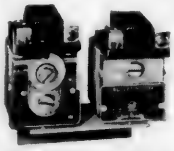
Bulletin 836 pressure switch

Bulletin 640 Manual Resistance Starters

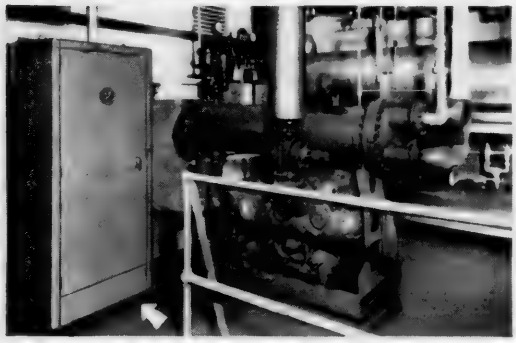
Bulletin 849 pneumatic timer



Bulletin 646 Manual Autotransformer Starters

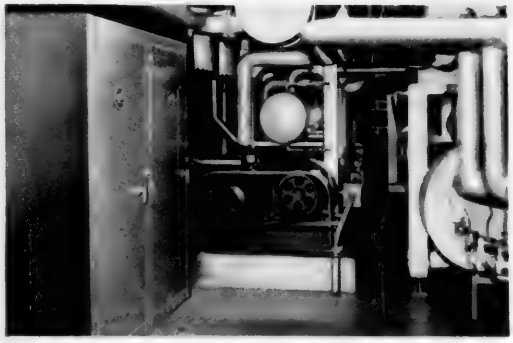


High and low pressure cutout



Bulletin 740 Automatic Resistance Starter

Bulletin 800 3-way selector switch



Bulletin 746 Automatic Autotransformer Starters

The Sign of Quality Motor Control

Allen-Bradley motor starters have the simplest contact mechanism yet devised for air-conditioning or refrigeration installations . . . only ONE moving part . . . the solenoid plunger which carries the double break contacts.

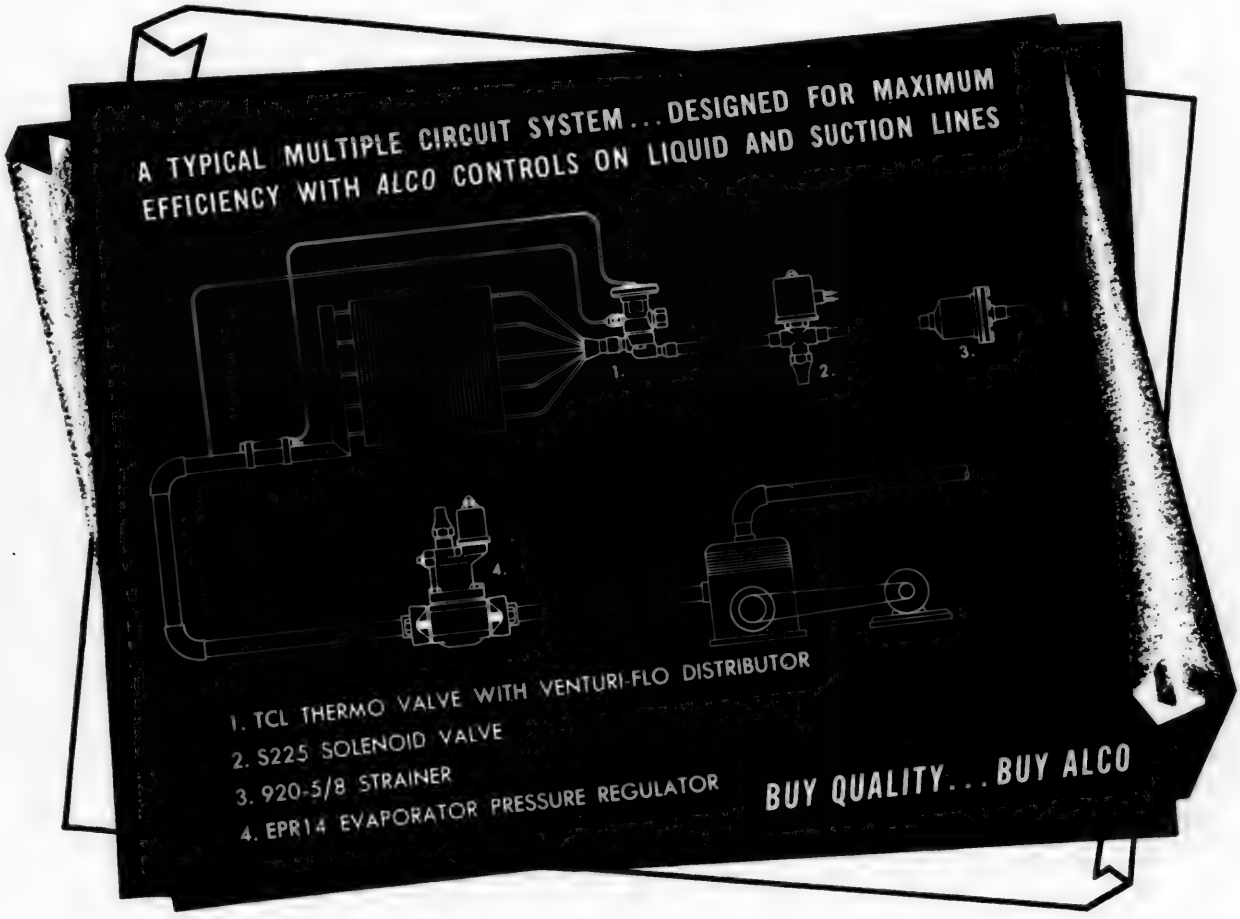
There are no trouble-causing pins, bearings, or jumpers. The cadmium silver alloy contacts never need cleaning, dressing, or filing . . . eliminating costly and troublesome maintenance.

Allen-Bradley timers, pressure and temperature switches are reliably accurate . . . precision operation is maintained over long periods of service.

Specify Allen-Bradley—the name that stands for "Quality" motor control. You cannot make a better selection!

Allen-Bradley Co.
1330 S. Second St., Milwaukee 4, Wis.
In Canada —
Allen-Bradley Canada Ltd., Galt, Ont.

ALCO MAKES
every fluid control you need
...for any refrigeration system


A TYPICAL MULTIPLE CIRCUIT SYSTEM... DESIGNED FOR MAXIMUM EFFICIENCY WITH ALCO CONTROLS ON LIQUID AND SUCTION LINES
1.
2.
3.
4.
1. TCL THERMO VALVE WITH VENTURI-FLO DISTRIBUTOR
2. S225 SOLENOID VALVE
3. 920-5/8 STRAINER
4. EPR14 EVAPORATOR PRESSURE REGULATOR
BUY QUALITY... BUY ALCO

The one complete line of refrigerant controls: Thermostatic Expansion Valves, Refrigerant Distributors, Solenoid Valves, Suction Line Regulators, Flooded Evaporator Controls and Reversing Valves

SEE YOUR ALCO WHOLESALER

ALCO VALVE CO.
859 KINGSLAND AVE. • ST. LOUIS 5, MO.

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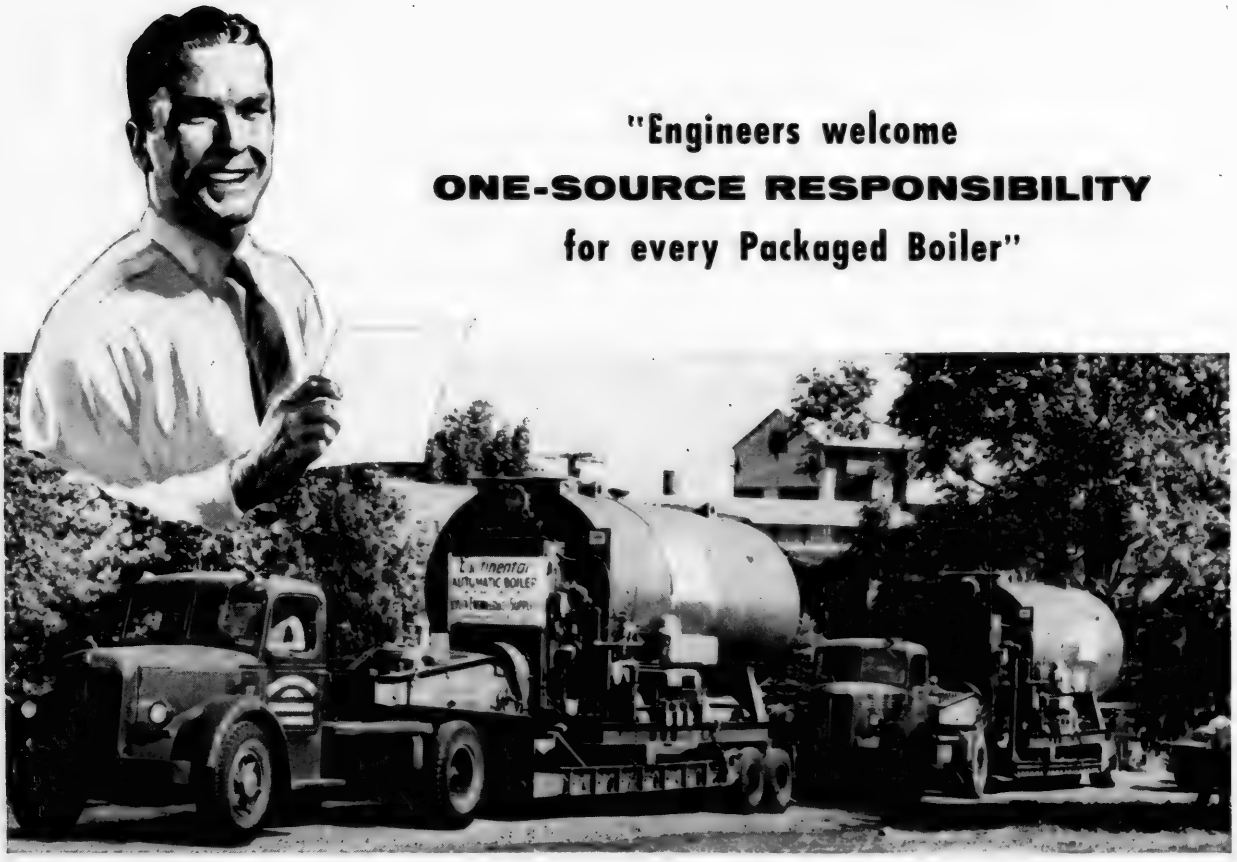


"Engineers welcome ONE-SOURCE RESPONSIBILITY for every Packaged Boiler"

Six Reasons Why it Pays to Buy a

CONTINENTAL

Automatic Boiler

* Guaranteed 80% efficiency . . . Fire-tested before shipment . . . Range, 20 to 500 hp.
* Simple, practical two-pass design, for uniform flow of combustion gases through all return tubes.
* Maximum radiant heat transfer achieved by "Spinning Gas" technique for thorough mixing of air and atomized fuel.
* High-CO_2 and low-temperature stack gases — proof of high combustion efficiency.
* Free, rapid water circulation improves heat transfer, keeps heating surfaces clean.
* Easy access to furnace and all return tubes. Refractory baffles and brickwork are not required.

"As an engineer, I want to know who is responsible for the trouble-free performance of every boiler I specify. With a built-up fire-tube boiler, each component may have a different manufacturer. When service is needed, it's often impossible to pinpoint responsibility.

"But with a Packaged Boiler, it's easy. The company on the nameplate is the one reliable source of responsibility for uninterrupted, smooth, economical functioning of every part. To a busy engineer and a busy plant, the single source of responsibility for Packaged Boiler operation is a factor that cannot be overemphasized.

"So, for completely dependable, low-cost performance . . . and one-source responsibility whenever the need arises . . . I know I can rely on Packaged Boilers for every heating and processing need."

For details on the Continental Automatic Boiler, send for Bulletin BE-3

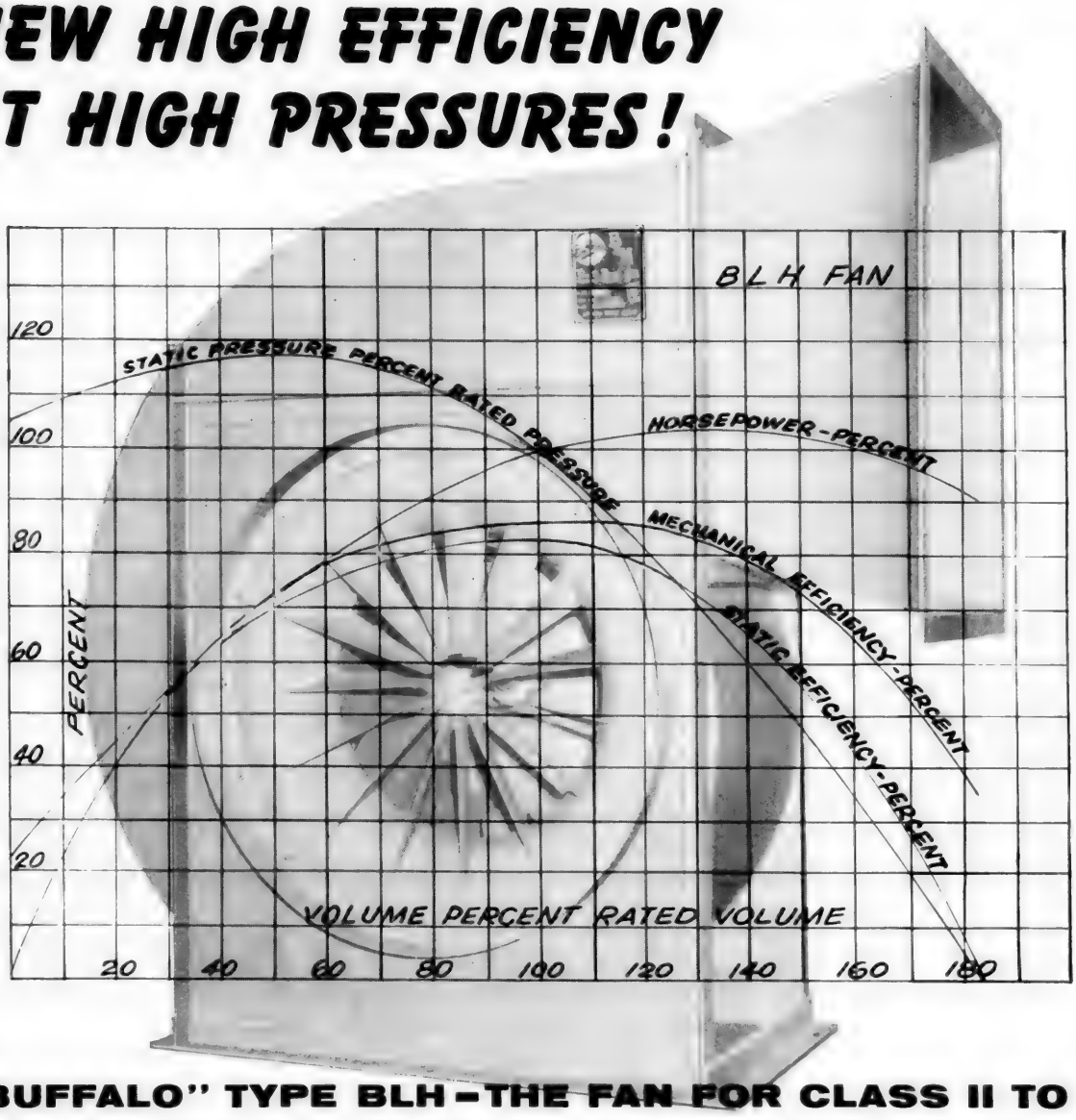
BOILER ENGINEERING & SUPPLY COMPANY, INC.

7 Manavon Street, Phoenixville, Pa.

A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

The Continental AUTOMATIC BOILER

NEW HIGH EFFICIENCY AT HIGH PRESSURES!



"BUFFALO" TYPE BLH—THE FAN FOR CLASS II TO IV HEAVY-DUTY VENTILATING AND AIR CONDITIONING

86% MECHANICAL EFFICIENCY—not just "on paper", but in actual performance, for complete satisfaction on your modern high-pressure conduit air conditioning, mechanical draft and industrial jobs. This performance is due to the complete inlet-to-outlet streamlining that is designed into every "Buffalo" Fan.

INLET. The well-known smooth "Buffalo" inlet bell now has cantilevered inlet vane to guide the air smoothly into the wheels, stabilizing flow under any inlet conditions and maintaining highest efficiencies. Wide inlet collar makes duct connection easy.

WHEEL. The wheel has the highly efficient "Buffalo" non-overloading backward curved blades and a deep-drawn inlet flange which mates with the inlet bell to form the ideal true half-circle entry into the wheel.

OUTLET. The new divergent outlet reduces turbulence from fan cutoff into duct while making a *gradual* (instead of sudden) change from velocity to static pressure. Gives air the smoothest ride in history, for maximum efficiency.

"Q" FACTOR* CONSTRUCTION of the "Buffalo" Type BLH provides a new standard of performance impossible without this *complete* fan streamlining of inlet, wheel *and* outlet. Here, literally, is the "best of our 79 years"—the BLH—available to you in wheel diameters from 18¼" to 80¾".

•

Write for Bulletin F-200 on your letterhead.

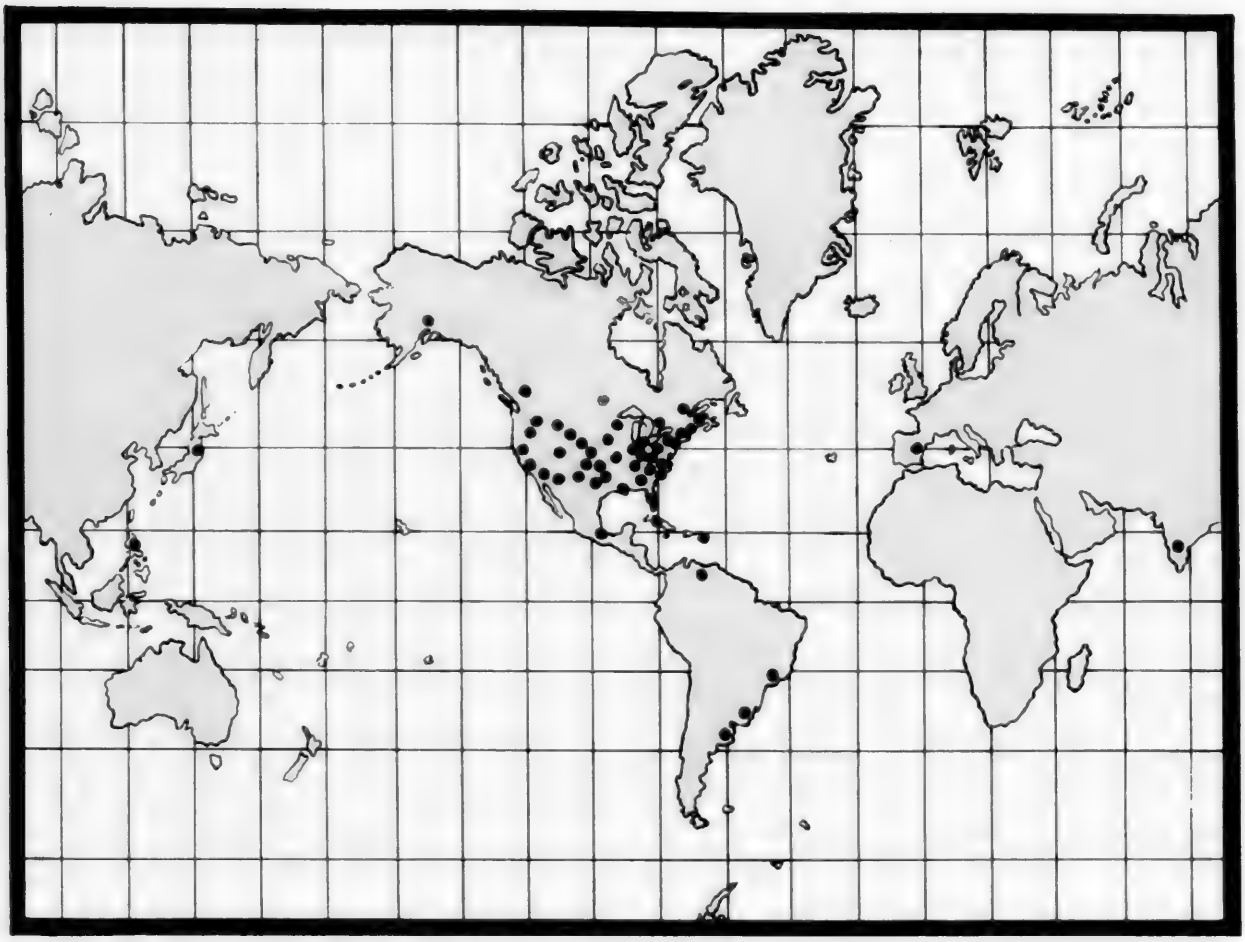
**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY
BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING



RIC-WIL offers WORLD WIDE

Service for Prefabricated Piping Systems

Over 75 field offices, both national and international are at your disposal on any project dealing with prefabricated piping systems. These field representatives offer on the spot assistance in planning, delivering and installing underground or overhead piping. A Ric-wiL representative will be glad to discuss plans involving steam, hot water or oil distribution lines . . . and he represents the world's largest supplier of prefabricated piping systems.

For the name of your nearest representative or the catalog covering the Ric-wiL line, call or write the home office.

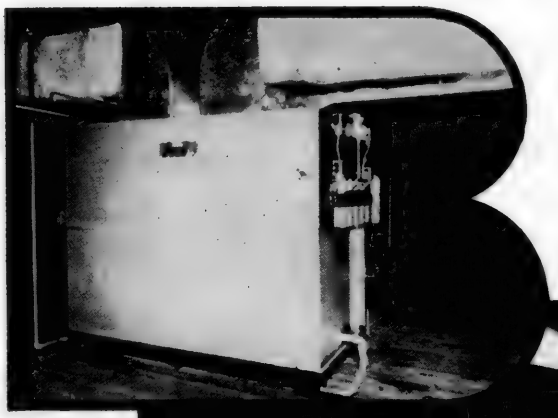
Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

SINCE 1910

RIC-WIL INCORPORATED — PREFABRICATED INSULATED PIPING SYSTEMS

BARBERTON, OHIO

IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED



DUNHAM-BUSH, INC. AIR CONDITIONING . . .

Handling FOUR-FOLD Job at Ultra-Modern GALLO Winery

A DUNHAM-BUSH Vertical Air Handling Unit provides both product temperature control and comfort conditioning . . . handles both cooling and heating requirements in the ultra-modern bottling room at E. & J. Gallo Winery, Modesto, Calif. Face and by-pass damper sections, mixing box assembly and filter section permit flexibility and close control of the conditioned area.

Whatever *your* air handling requirements, there's a DUNHAM-BUSH unit to meet them. Available in vertical floor-mounted or horizontal ceiling-hung models in capacities from 2.5 to 90 Tons . . . with a wide selection of accessory equipment to exactly meet any special needs. Models from AH10 to AH32 incorporate famed Inner-Fin extra-efficiency coil construction—patented DUNHAM-BUSH exclusive.

Request catalog #710 containing complete specifications on Dunham-Bush Air Handling Units.

DUNHAM-BUSH

BIG or SMALL . . .

Peerless Blowers Solve All Types of Ventilation Problems

AT left is a large Peerless Backward Curve Blower installed on the roof of one of the nation's largest automobile body plants. Its job is to draw air from the ceiling of the press room and discharge it, for ventilation purposes, into the press pit which is below ground level.

AT right is a grouping of 39 small Centrifugal Exhaust Blowers on the roof of a 14-story, 299-unit apartment building. They handle about 30,000 cubic feet per minute exhausting odors and stale air from kitchens and bathrooms in the apartments below.

VERSATILITY in size and application has always been a Peerless strong point. Our engineers design to suit the existing conditions. You're not buying "off the shelf" when you specify Peerless Fans and Blowers for a specific exhaust or ventilation problem.

PEERLESS Fans and Blowers are unconditionally guaranteed to meet all established industry test codes (NAFM or PFMA). Their outstanding service records speak well for their dependable performance. 100% factory inspection assures constant top quality.

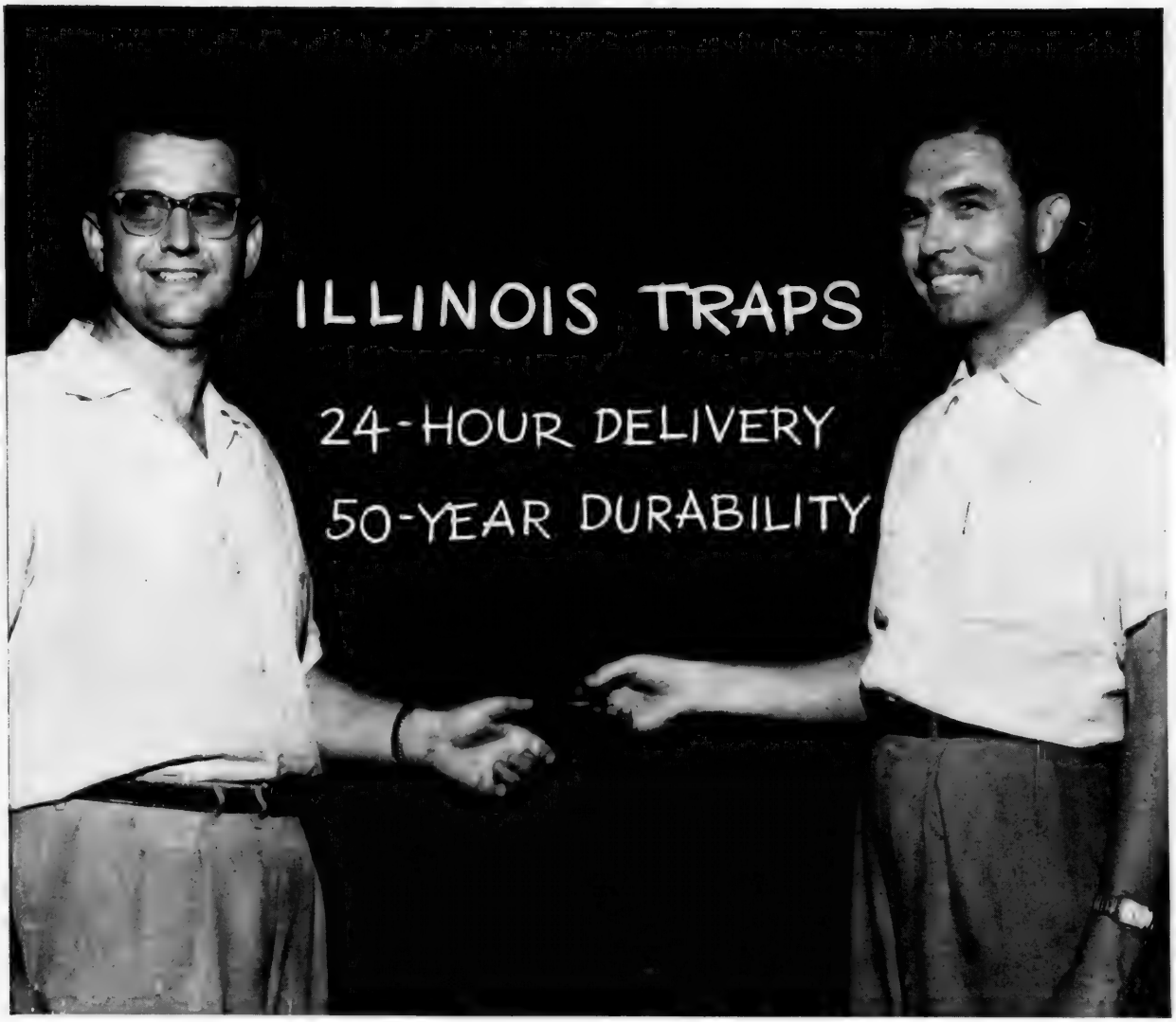
FAN AND BLOWER DIVISION

THE Peerless-Electric® COMPANY

1400 W. MARKET ST. • WARREN, OHIO

FANS · BLOWERS · MOTORS · ELECTRONIC EQUIPMENT

Write, wire or phone today for Bulletins SDA-160 or SDA-200.



They've written the story on the blackboard—two reasons why 95% of the steam traps in Elkhart, Ind. schools are Illinois. "Next day" delivery of traps and parts is a good reason for *anyone* to specify Illinois Engineering traps, but there are other reasons, especially if you're interested in long service and low maintenance costs.

Take Elkhart's experience, for instance. School plumbing-heating engineer Richard Lantz (left) tells us the first Illinois radiator traps were installed in an Elkhart school in 1905. (They're still operating and Lantz can still get parts for them.) Since then, most all the traps purchased by Elkhart's schools have been Illinois. Some other brands have been tried, of course, but they've usually been replaced by Illinois.

The yearly maintenance cost of Elkhart schools' Illinois traps averages only a few cents per trap. And the Illinois representative, Bill Ervin (right), is looking for ways to help Lantz cut that!

But Lantz is more than happy with the traps just as they are. "We don't replace Illinois traps," he says, "just the discs every 8 to 10 years." Lantz has *never* replaced, renewed, or repaired a stainless steel seat in an Illinois trap.

Specify a trap you can install and forget about for 50 years . . . Select from a complete line of Thermostatic Traps, Float and Thermostatic Traps, and Steam Traps—25 inches vacuum to 600 lbs. pressure. Write for Bulletin 110 today.

illinois ENGINEERING

Illinois Engineering Company

2025 S. Racine Ave., Chicago 8, Ill.

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

Heating Specialties • Power Specialties • Control Systems

another GIANT cooling job by MARLO

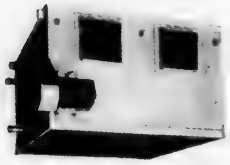
General Contractor:
George Hyman Construction Co., Washington

Mechanical Contractor:
Alliance Plumbing and Heating Co., Washington

Architect:
David Baker, Washington

Engineers:
General Engineering Associates, Washington

popular food chain again chooses Marlo equipment for newest outlet



AIR HANDLING UNIT

COOLING TOWER

This latest addition to the Giant chain of supermarkets in Washington, D. C. is the 19th Giant store to be air conditioned with Marlo equipment . . . undeniable evidence of Marlo's dependability and efficiency.

Marlo products specified for this installation included a ceiling type air conditioning unit, ceiling type heating and ventilating unit and two 25-ton cooling towers.

The Marlo line includes a wide variety of quality equipment to help you solve your air conditioning and low temperature cooling problems.

MARLO coil co.

SAINT LOUIS 10, MISSOURI

Quality Air Conditioning and Heat Transfer Equipment Since 1925

OUR CHALLENGE STANDS...

anything that can be made of steel sheets can be made of

Your very first sheet of Wheeling SOFTITE will prove to you that here is a galvanized sheet that is *different*. It's easier to work. No matter *how* you form it, Wheeling SOFTITE will not chip or crack! As a matter of fact, the zinc coating on this new ductile sheet is so *tight*-coated, you can use it to make anything that can be made of steel sheets.

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AN IMPORTANT NOTICE
To the Air Conditioning Industry...

TO ALL UNARCO DISTRIBUTORS AND DEALERS

The recent acquisition by National-U. S. Radiator Corporation of the Air Conditioning Division of Union Asbestos & Rubber Company will afford you a continuation of the same high quality air conditioning equipment that UNARCO has furnished heretofore. UNARCO products have achieved a national reputation for excellent design, outstanding performance and demonstrated reliability. This reputation will be maintained.

The entire resources of National-U. S. Radiator Corporation are behind UNARCO Air Conditioning Products. Our intensive program of research and development has as its prime objective the achievement of leadership in this field.

UNARCO equipment will continue to be manufactured in Greenville, Illinois, and is being distributed by the same selling organization and through the same channels as in the past. We are looking forward to your continuing as very valued customers under this new management arrangement.

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give comfort when others fail!

Another new Kramer achievement. Muggy-Air-Control takes the "chill and dampness" out of cooling on "muggy days" without reheat or dampers.

With two independent refrigerant circuits the upper circuit can be cut out on high humidity days. This sharply increases the dehumidifying effect by lowering the coil refrigerant temperature. Air is by-passed through the non-operating circuit and will mix with the dehumidified air to give desirable discharge temperatures and thus overcome short-cycling and uncomfortable conditions on muggy days.

Other distinct features of the Kramer Air Conditioning Unit are: the "Blow-Through" design, the Anti-Sweat construction, the "floating power" mounting, the nearly silent operation, and the eye appealing design.

WRITE FOR BULLETIN NO. AC-238

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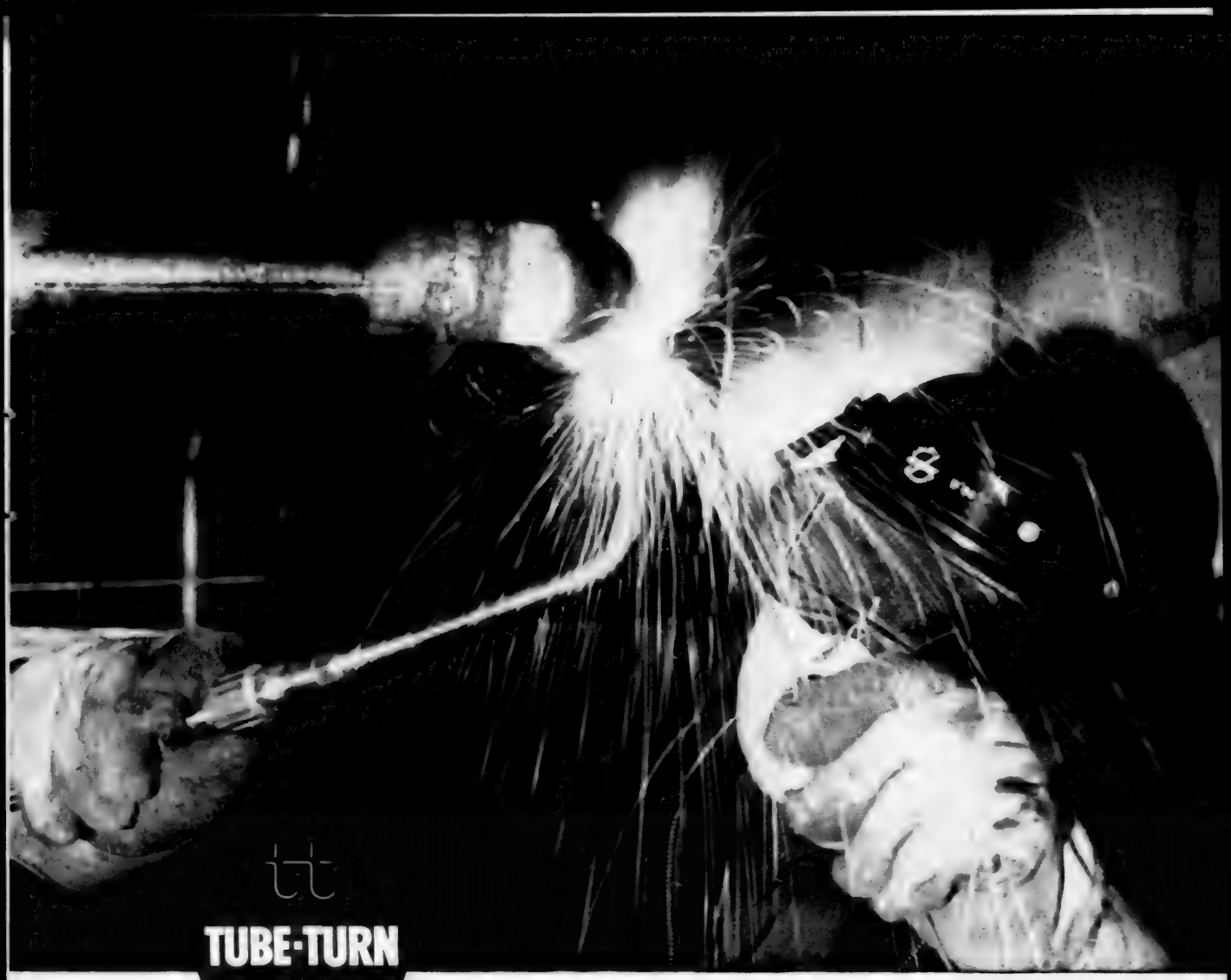

TUBE-TURN

In small piping too you get big savings by welding

Five years ago, the generally accepted practice among engineers and contractors was to weld non-critical pipe larger than 2-inches and thread the smaller sizes. Today, that dividing line has gone down; much piping as small as ½-inch is now being welded. In small piping as in large, the big reason for welding is *to save money* . . . in installation cost, in material cost, in maintenance cost. See next page for typical results. For the small pipe jobs, too, you get the *most for your money* when you specify and buy TUBE-TURN* Welding Fittings and Flanges. Your nearby Tube Turns' Distributor can give you speedy service in sizes from ½-inch to 42 inches!

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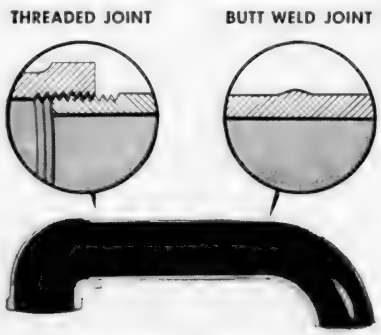
SMALL DIAMETER PIPING... *why it pays to specify welded construction with* TUBE-TURN *Fittings*

NEVER LEAKS. Welded joints are permanently as strong and leakproof as the pipe itself. Photo shows welded lube oil lines for one of four diesel engines, replacing threaded lines which leaked. If welded in first place, would have saved $4000 replacement cost. Pipe is 2½" with TUBE-TURN Fittings.



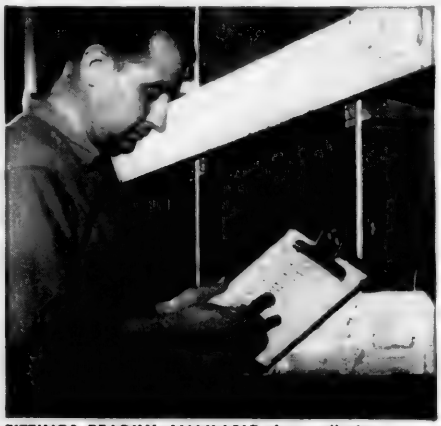
CUTAWAY SECTION
OF 2" SCHED. 40 PIPE

SAVES MATERIAL. Threading cuts half of pipe wall away as shown. The welded joint is as strong as the pipe. An installation of Schedule 40 pipe, welded, is stronger than Schedule 80 threaded. Hence, for equal strength welded piping can cut material costs 30-50%.

TAKES LESS TIME to weld than to thread pipe above 2" and about equal time for smaller sizes, according to recent tests on hundreds of joints made by many different pipe fitters. Welded joints in 1½" piping such as the school heating line shown, averaged 7 minutes compared to 8 minutes for threading and tightening fitting.

IS COMPACT, NEAT. This installation of 1½" and 2" boiler blow-off piping shows ability to nest welded lines close together for better layout and streamlined appearance. Also, insulation, where needed, is easier to apply.

TOOLS ARE SIMPLE. Small, inexpensive welding outfits can cut, weld, heat to bend, solder or braze. They are easy to haul to job and simple to use. All pipe for this factory radiant heating system was fabricated on the site.



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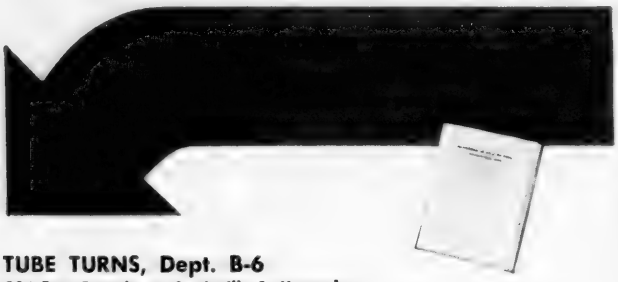

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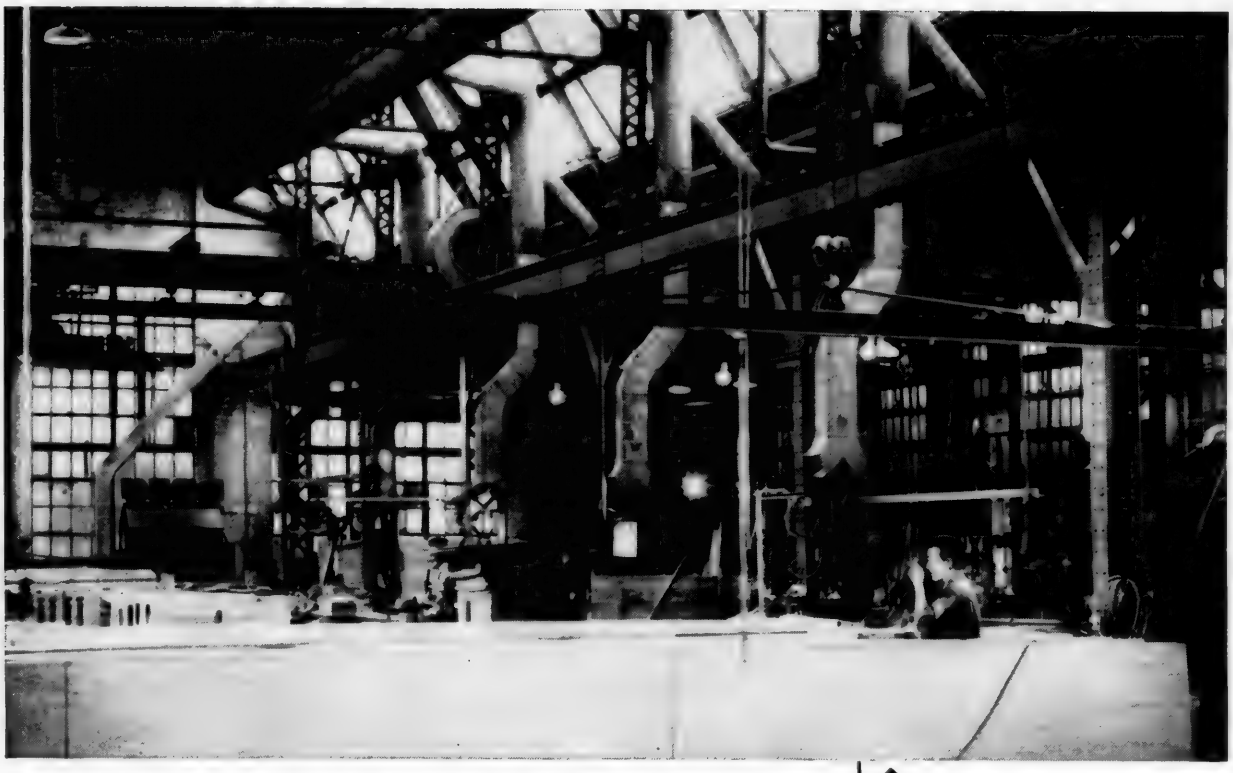

Richards-Wilcox more than doubles heating capacity

...cuts heat operating costs in half!

Plant heating problems first began for the Richards-Wilcox Manufacturing Co. of Aurora, Illinois, during World War II. Then, the existing steam plant, operating at full capacity, could not meet the heat requirements for new production areas. Immediate solution was the addition of two warm air space heaters.

Later, a 750,000 btu Dravo *Counterflo* heater was installed to serve additional expansion. But in 1951, facing even more expansion, Richards-Wilcox plant men thoroughly surveyed their total plant heating problem.

The existing boiler had to be modernized, an additional boiler and accessory equipment had to be added. Operating costs of this contemplated step were discouragingly high! Experience with space heaters suggested an alternative that promised real economies—dismantling of the steam plant and converting the entire plant to warm air heating. This plan was adopted on a 3 year basis.

From 1951 through 1953, twenty-four Dravo *Counterflo* heaters were put into service. Richards-Wilcox personnel installed recording instruments on every unit to determine fuel consumption and efficiency. After two years of service, the records show that Dravo heaters provided more than enough heating capacity for complete worker comfort and had *cut operating costs to less than half of the former system.* Service costs, too, were 50% less than anticipated.

Such economy is only a part of the many exclusive advantages Dravo heaters can bring in heating your plant, warehouse or building. It will pay you to thoroughly investigate quality Dravo heating systems—and see the dollars and cents reasons behind every feature. For prompt information, mail the coupon today.

▲ This Dravo *Counterflo*, on the far wall, distributes heat up to 150 feet away. Richards-Wilcox's complete Dravo system of 25 units provides 21,700,000 btu per hour to a 6 acre plant area. Ductwork visible is part of abandoned steam heating system.

At the Richards-Wilcox plant, Dravo heaters serve dual heating jobs—heating both the local area and, through duct take-offs, serve adjacent areas. ▼

Dravo Corporation, Department A-3912
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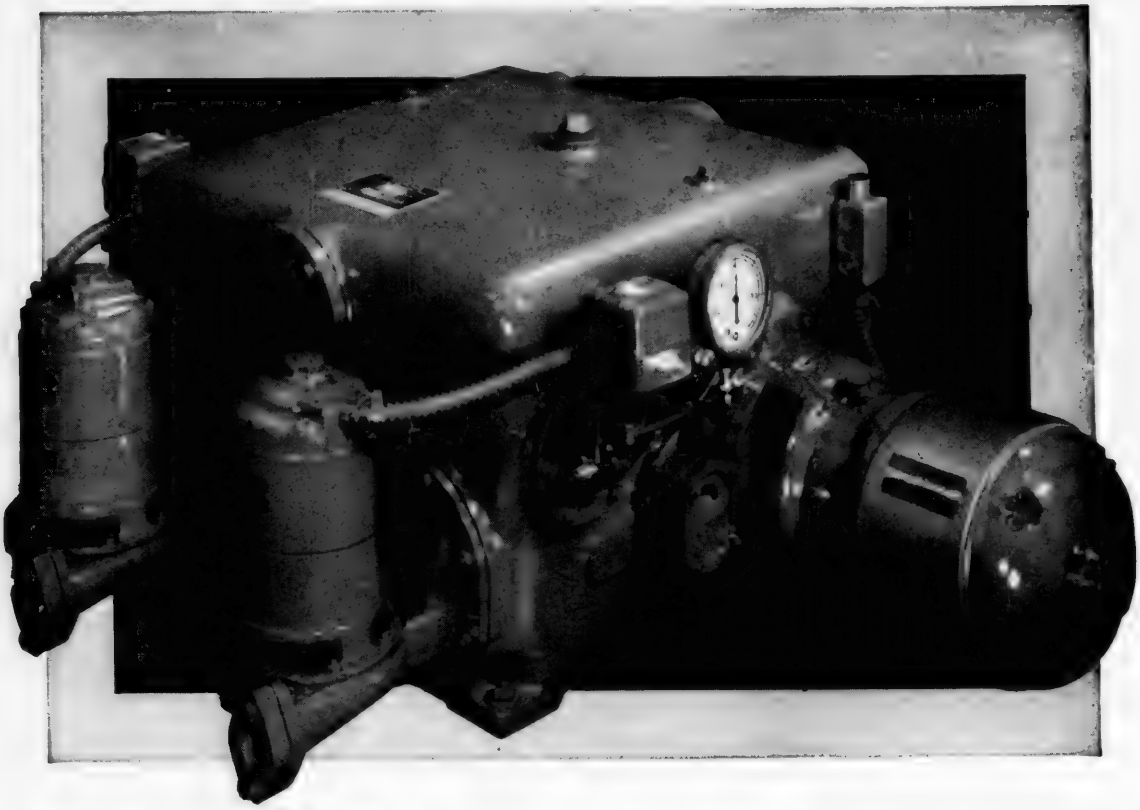
THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.

Heating, Ventilating and Air Conditioning for a Helicopter Plant

E. V. HUNT
Member, Albert Kahn Associated Architects and Engineers, Detroit, Mich.*

An office building and a large industrial plant for the manufacture of helicopters were erected at Stratford, Conn. Design of the heating, ventilating and air conditioning installations are described to aid the engineer.

UNUSUAL and rather interesting heating problems were presented in designing the new plant for the Sikorsky Aircraft Division of the United Aircraft Corporation—a plant that is now in operation at Stratford, Conn. Consultants were Albert Kahn Associated Architects and Engineers of Detroit, Michigan.

Constructed on a completely new site of 250 acres, the majority open land to be used as flight and testing areas, this new plant affords more than 800,000 sq. ft. of floor space, approximately 630,000 sq. ft. of which will be devoted to the production of helicopters. In addition to the main manufacturing and office building, there are a number of smaller auxiliary structures such as the boiler house, hazardous storage building, garage and fire headquarters building, and three test stands.

Miscellaneous Features

The main manufacturing building is 820 ft long by 700 ft wide, not including the hangar area at the northeast corner, which is 180 ft wide and 200 ft long making the total factory length of 1120 ft along the east side. The hangar and adjoining final assembly area, located along the east side of the factory, have a combined length of 840 ft and a width of 180 ft. Average height between the floor and the underside of the roof in this section is 57 ft; the remainder of the manufacturing area has an average height of 24 ft.

There is an attached two-story office building with a basement which extends beyond the south end of the factory for a distance of 60 ft and has an overall length of 520 ft.

Kitchen, cafeteria and private dining facilities are housed in a structure 60 ft wide by 270 ft long, attached to the east side of the factory near the southwest corner.

At the northeast corner of the hangar is a two-story projection 80 ft long by 40 ft wide which is known as the pilots' ready area.

Other special areas inside the factory proper are: First aid facilities, including a basement locker room for factory employes, located on the west side at the main factory entrance near the northwest corner; a laboratory area located along the west side directly south of the first aid section, and a factory office area at the southeast corner.

Construction consists, generally, of a structural steel frame composed of columns and roof trusses. The column spacing in the low bay area forms bays 40 ft by 60 ft and 40 ft by 70 ft. Interior columns could not be tolerated in the high bay required for the hangar and final assembly area. Consequently, huge 24-foot deep carrying trusses span the 180-foot width of this area

* Part of article dealing with air conditioning was prepared by Herbert E. Ziel, mechanical engineer of the Kahn organization.

Interior of spray booth looking south into the High Bay Area of the plant.

every 60 ft and support the smaller roof trusses which are installed in the opposite direction.

The plant is enclosed by curtain walls composed of 4 inches of brick backed up with 8-inch concrete blocks 8 ft high, with steel sash and insulated metal siding above. The roof, some 18 acres in area, is constructed of two inches of poured gypsum on rigid board and five-ply roofing.

Since expected production requirements indicated a heavy demand for steam at reasonably high temperatures in the plating and anodizing processes, it was decided that the most economical heating system for the production areas of the plant would be a medium pressure (30 lb) steam distribution system employing unit heaters as the heat dispensing medium. An important factor in determining the steam pressure was the decision to use steam driven air compressors in the boiler house at 35 psi back pressure, thus making available a considerable quantity of steam which could be economically re-used for heating and process purposes.

In addition to the problem of heating the plant, there was, also, the problem of ventilation which required provision for: (1) Some air movement the year around in the center areas remote from the outside walls, and (2) adequate make-up air to satisfy the industrial exhaust requirements. The industrial exhaust from this building amounts to approximately 400,000 cfm, exclusive of the paint spray booths and final assembly preparation area which add another 280,000 cfm. The latter item was provided for by local make-up air units, furnished and installed as a part of the spray booth equipment.

Factory Ventilation

The ventilation system for the factory was designed to meet varying seasonal requirements. This was accomplished by laying out a definite pattern for installation of summer supply units, winter supply units and summer exhaust units. The pattern was started by placing a row of summer exhaust units approximately 100 ft apart, parallel to the outside walls but in from the walls 50 to 100 ft. Next a row of supply units was installed one bay nearer the middle of the building, but spaced in alternating positions to the above exhaust units. Then, continuing towards the middle of the building, another row of summer exhaust units was installed in line with the first row in both the east-west and north-south directions. This scheme was repeated until the entire factory area was covered. The alternate rows of supply and exhaust units for a diamond shaped pattern with a diagonal distance of approximately 90 ft between a supply and exhaust unit.

Winter or year-'round supply units, with a capacity of 25,000 cfm each, were dispersed throughout the above pattern in sufficient quantity to maintain a slight excess over the industrial exhaust requirements, and at the same time provide fresh air to the innermost sections of the plant. Not only were the winter supply units incorporated in the overall ventilation design, but they were integrated, also, into the unit heater pattern in such a manner as to permit their use for heating as well as ventilating a given area.

Summer supply and summer exhaust units, with a capacity of 20,000 cfm each, were provided in adequate numbers to produce an air movement in the summer equivalent to 2 cfm per sq ft of floor space. This is equal to 10 air changes, 12 ft high, for the entire manufacturing area when coupled with the winter supply units and industrial exhaust. The total amount of air supplied mechanically in the summer is less than the combined mechanical exhaust provided by the summer exhaust units and the industrial exhaust systems. This design is based on the assumption that the row of summer exhaust units adjoining the exterior walls will draw part of their air through open doors and windows.

The summer exhaust units are of the up-blast type, consisting of either a belt-driven, or direct connected, propeller fan in a heavy gage galvanized sheet metal housing with clam-shell dampers mounted on a curbed opening in the roof.

These summer supply units are standard factory built units mounted on a curbed roof opening with a direct-connected propeller fan in a heavy gage galvanized sheet metal housing with a weather-tight hood and multi-blade shut-off damper operated by a spring return damper motor. These units are equipped with a duct extension connected to the underside of the roof opening and terminating in an adjustable blade diffuser outlet at the bottom chord of the roof truss.

The winter supply units are built up from standard manufactured items inter-connected in the field with shop made sheet metal connections designed to meet job conditions. The heart of this is a horizontal blower type unit heater hung from the roof purlins and equipped with a non-freeze coil, also face and bypass dampers. Air enters the heater through a weather-tight roof hood, housing a multi-leaf damper with a spring return damper motor, and mounted on a four foot square, curbed, roof opening. These air intake hoods are identical with those used for the summer supply unit except for absence of the fan and fan motor. A metal transition connection is installed between the underside of the roof opening and the inlet end of the unit heater. The discharge from the heater is a specially designed sheet metal outlet, from rectangular to round, terminating in an adjustable blade diffuser located at the bottom chord of the truss.

All of the curbed roof openings, regardless of their use, were made four feet square in order to provide maximum flexibility, since production requirements in a factory of this nature change from time to time. What to-

day might appear as a logical location for a summer exhaust unit could be an ideal location for a winter supply unit six months hence. A liberal sprinkling of spare roof openings, with removable caps, provides additional flexibility to meet future contingencies and changing requirements. These openings are formed with angle irons and structural channels having a curb made up of 4 in. x 3 in. angles with the 4 in. leg out-standing, thus forming a curb with an outside edge 56 inches square. Roof openings and curbs were fabricated and erected by the structural steel contractor. It was necessary, therefore, to have the order placed with the steel mills and fabrictaors long before it was possible to decide what make of ventilator was to be used on the job. Consequently, the manufacturers of the roof hoods were required to furnish a unit with a lip dimension to fit over the predetermined curb. This did not, however, appear to impose any undue hardship on the ventilator suppliers.

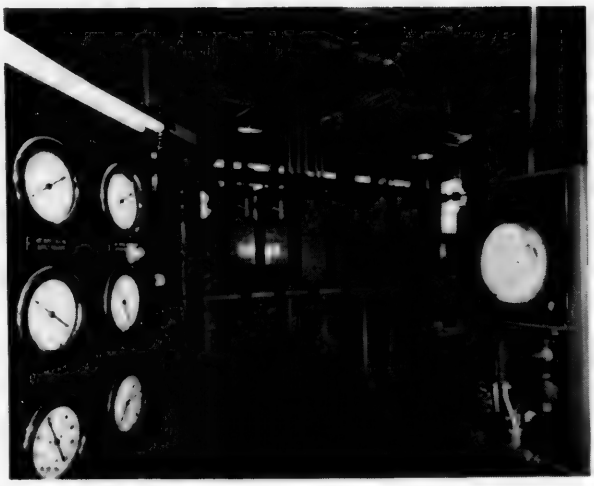
The winter supply units are started by push-buttons which energize the motor starters and open the fresh air dampers. From this point on, the fans run continuously until manually turned off at the push-buttons. Temperature control is accomplished by means of a modulating type room thermostat in series with a low-limit duct-stat set at 68 deg and mounted in the heater discharge duct. These stats position the face and bypass dampers and automatic valve in the steam supply line. The latter operation can be performed simultaneously or in sequence depending upon the make of controls used. In the sequence operation, the automatic steam valve remains wide open until the face dampers are entirely closed; then, if the temperature continues to rise beyond the set control point of the low-limit stat, due to radiant heat from the coil, the steam valve is modulated towards the closed position. In addition to these controls, a freeze-up stat is mounted in the fresh air intake and set at 35 deg. Whenever the outside air temperature drops to this point, the freeze-up stat takes over control of the steam valve and holds it in a wide open position.

Factory Heating

The manufacturing area of the main building is heated with vertical projection unit heaters, hung in the truss space at regular intervals, with blower type unit heaters used to blanket all large exterior doors. These are supplemented by the winter supply units as previously described. Duct extensions, terminating in outlets with adjustable horizontal vanes, are provided on the blower unit heaters at the doors to convey the heated air down to the head where it is discharged across the door opening.

The hangar area presented the most difficult heating problem since practically the entire north end opens up to permit ingress and egress of the larger planes. This door is of the three section cantilever type, 170 ft wide by 36 ft high; 120 ft south of the main door in both the east and west walls, and directly across from each other, are two smaller doors of the same type. These doors each measure 50 ft wide by 36 ft high.

Two blower type unit heaters with a capacity of 750,000 Btu each were placed on the floor at each side of the large door with the discharge outlets directed across the door opening. These were supplemented by two 600,000 Btu each were placed on the floor at each side of truss space approximately 50 ft in from each side of the door opening. Each of the smaller hangar doors was treated in the same manner, except that the capacity of each of the floor mounted heaters was 500,000 Btu and only one 600,000 Btu vertical projection heater was used as a back-up unit.



Hot water and chilled water pumps plus equipment located in Fan Room No. 2 on the factory roof.

These vertical projection unit heaters, as well as all others used in the high bay area, were supplied with large capacity fans in order to produce an outlet temperature low enough to permit driving the warm air down to the floor with minimum curling off at the upper levels.

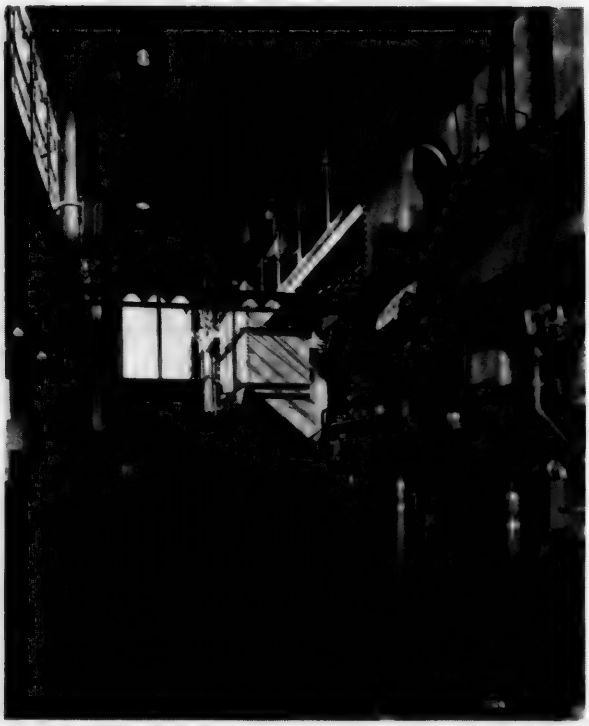
All blower type unit heaters used at the exterior doors are controlled by door switches and room thermostats, connected in parallel, so that either instrument can start the heater but both must be satisfied to shut off the unit.

The main steam services, consisting of a 10-inch high pressure (175 lb) line and a 10-inch medium pressure (30 lb) line, enter the northwest corner of the manufacturing building on a trestle from the boiler house.

Directly inside of the building wall, the above lines were dripped, and valved branch connections were installed in the top of the mains. From these valved connections, the mains were placed at the proper level in the truss space to clear the lights, bus duct, and other building services. They were then extended south, in the outside bay, to a point slightly beyond the center of the building and thence east in a parallel position to their point of termination near the high bay area. A 175 lb to 30 lb pressure reducing station was installed at the far end of the main headers. This is used to make up all the medium pressure steam which cannot be supplied by the air compressor turbines. In the event the air compressors are not supplying the full amount of medium pressure steam which the line is designed to carry, a pressure reducing station, installed in the boiler house, makes up this deficiency.

Feeding the long medium pressure main from both ends tended to neutralize the pressure drop and furnish a reliable source of steam at reasonable constant pressure.

Valved lateral branches were extended from the main medium pressure steam supply header to serve the various requirements of the building. Plugged tees were provided at convenient locations near the proposed plating



Looking down the firing aisle in the boiler house. Photograph shows oil burning equipment and controls, combustion control panel, and electric motor control center.

and anodizing areas for extension by the specialists engaged for these processes. Insofar as practical, costwise, the branch supply mains were divided into two categories: (1) Those supplying heating equipment only, such as unit heaters and winter supply units, and (2) those supplying year-round equipment, such as domestic water heaters, kitchen and cafeteria equipment, and blast coils of the air conditioning systems requiring summer back heating. This method of distribution enables the maintenance crews, in the spring of the year, to shut off the steam to a number of unit heaters and winter supply units in a large area of the building by closing one valve at the main header.

The condensate from all sources is collected into gravity return mains and conducted to four main duplex pumping stations. From these stations, the condensate is pumped up into a common pump discharge header in the truss space which extends along the west side of the building and across the pipe trestle to the boiler house in a parallel position to the incoming steam lines. In certain isolated areas, where it was impossible to lift the condensate up into the gravity returns in the truss space, due to the steam pressure or type of temperature control used, small package type condensate pumps were employed. The discharge from these local pumping units was connected into the medium pressure return mains in the truss space.

Hot Water Heating for Office Areas

The pilots'-ready, first aid and laboratory areas, as well as the small office area in the garage and fire headquarters building, are heated by means of separate forced hot water systems. The office and cafeteria buildings, along with the exposed wall of the factory office area, are heated from a central forced hot water system located in the fan room serving the east half of the office building. The fan room is situated above the roof of the factory building, adjacent to and adjoining the office building.

The ramp leading to the garage in the basement of the office building was provided with a snow melting system. The equipment involved in the system was the same as that used in the hot water heating systems, except that a solution of ethylene glycol was employed as the heat transfer medium instead of plain water. A distribution system of welded $1\frac{1}{4}$ in. wrought iron pipe, in the form of grids, was embedded in the concrete slab of the ramp.

Air Conditioning

The two-story office area and the blade room in the factory section are completely air conditioned. Air conditioning for the office area is designed to give year-'round comfort to room occupants.

The blade room requirements are definitely fixed as to temperature and humidity throughout the entire year.

In general, the air conditioning equipment for both the office area and the blade room are identical, the variations being in the control limits. The system consists of air filters, water cooling coils through which outdoor or recirculated air is drawn by a motor driven fan unit, and the fan unit which discharges the air through zone coils and ducts to various parts of the rooms. Requirements of the distribution system make it essential to provide different air temperatures around the outer zones near the exterior walls than for the interior areas where heat gains and losses throughout the year are nearly constant.

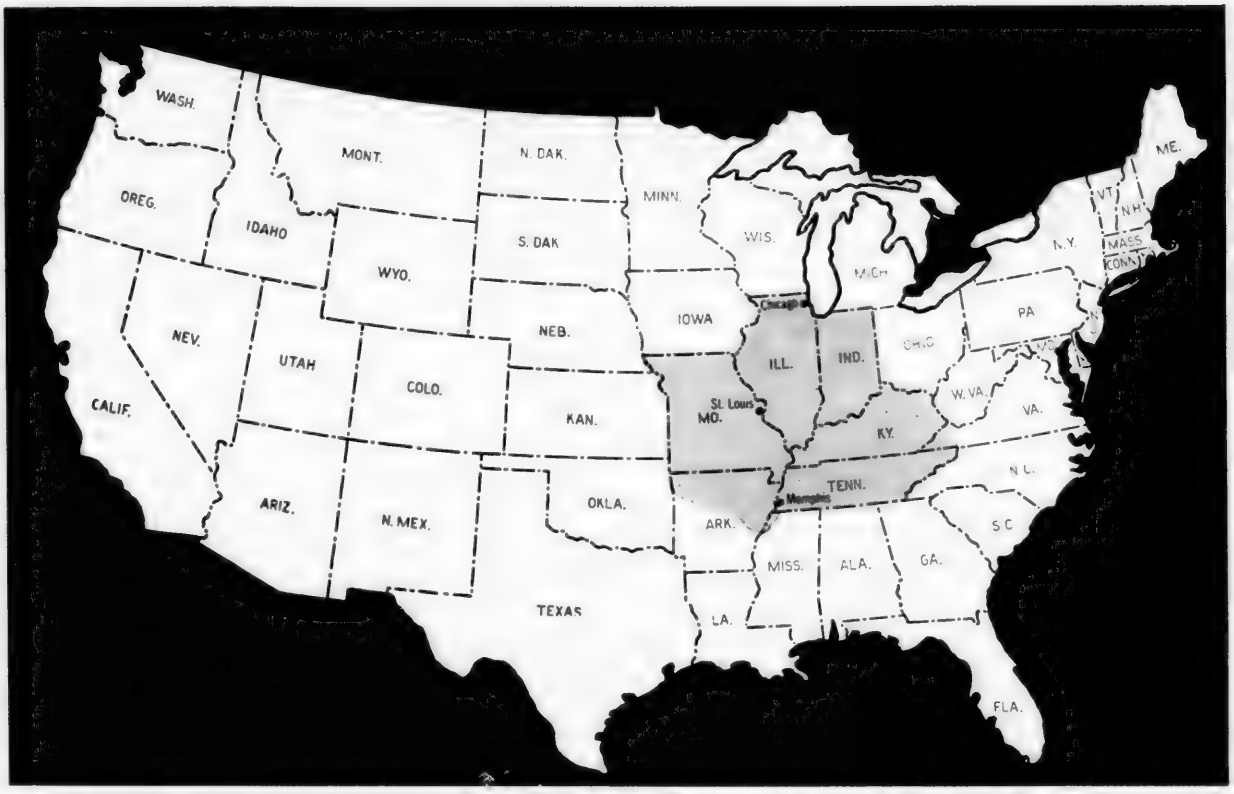
Although the blade room is one completely enclosed area, separate zones are provided sectionalizing this room to permit different degrees of temperatures on the supply air system to balance the heat release given off by various pieces of equipment. This makes it possible to obtain the same room temperature throughout, irrespective of the heat liberated by certain equipment.

Cooling and dehumidifying are obtained by means of a centrifugal refrigerating compressor which provides chilled water to the coils in the air conditioning units. No control is provided on this chilled water system other than that obtained with a suction damper on the refrigeration cycle, which gives a constant fixed delivery water temperature. This water temperature provides maximum cooling and dehumidifying of the air handled and at times may actually provide more cooling and dehumidifying than is required. The excess dehumidification can be compensated for by means of the steam grid humidifiers installed in the housings for winter humidification.

Condenser water for the centrifugal refrigerating compressor is obtained from a cooling tower. Dehumidifying and cooling may be required during the winter months in the blade room which imposes a higher degree of care in operating the cooling tower. During the periods of low temperatures in the cooling tower, baffles are provided at the intake tower and sufficient heat release is obtained through the side walls of the tower without operating the cooling tower fans.

Credits

General contractor was the E & F Construction Company of Bridgeport, Conn. Plumbing, air conditioning, heating and ventilating systems were installed by John Winkle, Inc., of Larchmont, N. Y.



Calculating the Heat Requirements of a Snow Melting System

Part 4 — Southeast Central Region

WILLIAM P. CHAPMAN

This is the fourth article of a series which will eventually cover all parts of the U.S. where snow melting systems are likely to be used. Previous installments covered a portion of the Northwest, Michigan, Ohio, Western Pennsylvania, and the Salt Lake City region.

The first article summarized the basic equation for heat required for snow melting and defined the free area ratio as the ratio of slab area free of snow to total slab area.

In order that each installment of this series can be understood, the opening information on class of systems and the explanation of the four tables are repeated.

THE total heat output of a snow melting system depends on the rate at which it melts the snow, and this rate in turn depends on the relative importance of rapid snow removal among the different types of applications. Snow melting systems can be classified as follows:

Class I (minimum): Residential walks or driveways and interplant areaways;

Class II (moderate): Commercial (stores and offices) sidewalks and driveways and steps of hospitals; and

Class III (maximum): Toll plazas of highways and bridges, and aprons and loading areas of airports.

These classifications depend upon the allowable rate of snow melting. For example, a residential system does not have to melt snow as rapidly as a commercial system. In fact, a depth of snow of an inch for an hour or so during a heavy storm might not be objectionable with a residential system. On the other hand, a store manager would claim the system was inadequate if half an inch accumulated on the sidewalk in front of his store. The difference, then, between a Class I system and a Class II system is in the ability of each system to melt snow. The one feature that is common to all classes is that the systems must be adequate for some combination of weather factors. Or, the designer wants to be able to say that he will pay to melt snow whenever conditions are milder than some critical value but he is willing to have an inadequate system for a given fraction of the time. In other words, the designer will run a calculated risk providing

he knows the odds of that risk. For a residential system, where initial cost must be at a minimum, the designer must accept more frequent snow accumulations.

Naturally, the owner is not concerned about an explanation of why there is an accumulation of snow on the sidewalk. It is immaterial whether the accumulation is due to excessive snowfall or whether it is due to an extremely cold snowfall. In both cases, the ultimate reason is that an inadequate flow of heat is reaching the surface. The true analysis of heat output, then, depends on an analysis of the weather. This is true of all three system classes.

The total heat requirements of a snow melting system are determined, therefore, by (a) the total area of the snow melting slab, (b) the rate at which the snow is to be removed, and (c) the values and frequency distribution of each of the pertinent climatic variables (humidity, wind, temperature, and snowfall). Obviously (c) varies from city to city and, due to the complexity and number of calculations to obtain a frequency distribution of the four variables, the evaluation of (c) has been virtually impossible. However, by the use of punched cards and statistical tabulating machines, data have been derived so that the heat requirements for a given city can be simply presented.

The designer needs two types of information. First, the most severe combinations of variables on which to base his *design output*, and, second, the heat required over the season so that *operating costs* can be determined. These data are given in Tables 1, 2, 3, and 4 which follow and which cover three cities in the Southeast Central region of the U. S.

Table 1

The first table gives some generalized information on snowfall and snow on the ground. The next to last item, "Greatest depth of snow on the ground" indicates the greatest depth to which snowfall has ever accumulated. Other items are self-explanatory.

Table 2

Table 2 contains the operating information of a snow melting system. For freezing temperatures (32 deg and below) but no snowfall the system may be "idling." That is, the designer may want to supply some heat to the slab so that there will be immediate melting when snow starts to fall. The column on mean temperature gives the average temperature during *freezing* temperatures. This temperature is used in calculating the "idling" load. The other term needed to calculate idling load is the wind velocity during the period of freezing temperatures.

The column "Hours of Snowfall" indicates the number of hours that snow is falling at rates equal to or greater than 0.01 inch of water equivalent per hour. Roughly speaking there are snowfalls of "trace" quantities about twice as often as there are for measurable quantities of 0.01 inch or more. It is assumed that these light falls can be handled by the idling load.

The remaining columns of Table 2 represent the frequency distribution of required heat output. This distribution is based on the solution to the basic equation for two values of the free area ratio A_r. This distribution represents the heart of the analysis and is also the basis for Tables 3 and 4.

Table 3

Table 3 contains the *design* heat requirement—as explained in the footnotes to Table 3. These design rates may be altered by the designer if he feels that a particular job should have a different design criterion from those given in the footnote. Any change in design selection should be based on the frequency distribution given in Table 2.

Table 4

Table 4 contains the data required to estimate the operating cost of a snow melting system. The footnotes to Table 4 explain the various items.

Use of the Tables

Example. Assume that the City of Memphis has requested a feasibility report on snow melting systems for all Memphis city buildings, such as schools, hospitals, libraries, fire houses, and clinics. What would be selected as the design rate?

Solution. From a study of the frequency rate, Table 2, it is obvious that a snow melting system in Memphis would be used primarily for exceptional cases. That immediately eliminates the Class I type of operation. In addition, however, it will be shown that Memphis climate can be extreme; consequently, fairly high loads can be expected. The maximum load of 227 Btu per hour per square foot and the Class III design load of 212 indicate that rule 4, footnote 3, of Table 3 was probably the governing rule in selecting the design rate. It seems logical, then, to disregard the Class II design rate, but instead use the full Class III design rate. The slight added cost in this case would be justified in view of the probability of extreme loads. In other words, if snow melting were advisable at all, then certainly the Class III design rate would be preferable to the Class I or II rates.

Southeast Central Region

The confluence of the Ohio and Mississippi Rivers lies in the heart of the South-East Central region. Roughly the northern boundaries of Missouri, Illinois and Indiana form the northern boundary of the region. The western edge of Missouri and the western edge of this region coincide, while the southern edge of Tennessee forms the southern boundary. The eastern edge of the region

TABLE 1—GENERAL INFORMATION ON SNOWFALL, SOUTHEAST CENTRAL REGION

Item	Chicago, Ill.	St. Louis, Mo.	Memphis, Tenn.
Approximate mean number of days with an inch or more of snow on the ground	70	40	10
Average number of inches of snowfall per year	33.8	17.3	5.2
Greatest snowfall in 24 hours, inches	14.9	20.4	18.0
Greatest depth of snow on the ground, inches	24.7	15.6	10.2
Mean number of days per year with snowfall of 1 inch or more	10	5	2 15 (with trace or more)

TABLE 2—DATA FOR DETERMINING OPERATING CHARACTERISTICS OF SNOW MELTING SYSTEMS IN THE SOUTHEAST CENTRAL REGION[1]

Period of No Snowfall

	Air Temperature, Deg. F[2]			
	Over 32	Below or Equal to 32	Mean Temperature During Freezing Period[6]	Wind Velocity, Freezing Period,[6] mph
	Per-cent of Winter Hours with No Snow at Above Temperatures			
Chicago, Ill.	45.4	50.9	21.4	11.5
St. Louis, Mo.	68.7	30.4	25.0	11.5
Memphis, Tenn.	87.2	12.5	27.0	11.5

Period of Snowfall[3]

City	Hours of Snowfall[2]		Free Area Ratio, A_r	Required Output, Btu per Sq. Ft. per Hr.[4]								Maximum Output, Btu per Sq. Ft. per Hr.
				0–49	50–99	100–149	150–199	200–249	250–299	300–349	350–399	
	Per-cent	Hr. per Year		Frequency Distribution of Snowfall Hours at Above Outputs, Per-cent[5]								
Chicago, Ill.	3.7	134	1	45.8	37.4	11.4	3.1	1.4	0.6	0.2	0.1	368
			0	91.5	8.1	0.3	0.1	—	—	—	—	165
St. Louis, Mo.	0.9	33	1	42.9	31.4	16.7	7.1	1.9	—	—	—	225
			0	85.2	11.6	2.6	0.6	—	—	—	—	152
Memphis, Tenn.	0.3	11	1	48.4	28.3	6.7	13.3	3.3	—	—	—	227
			0	85.0	8.3	6.7	—	—	—	—	—	144

[1] The period covered by this table is from Nov. 1 to March 31, incl., with February taken as a 28¼ day month. Total hours in period = 3630.
[2] The percentage in Columns 2 and 3 plus the percent under operating time total 100%. Note that "Hours of Snowfall" does not include idling time, and is not actual operating time. See text.
[3] Snowfalls of trace amounts are not included; hence, "Hours of Snowfall" includes only those hours of 0.01 inches water equivalent per hour snowfall.
[4] Output does not include allowance for back or edge losses since these depend on slab construction.
[5] Percentages total 100% of the number of hours per year of snowfall.
[6] "Freezing Period" is that during No Snowfall when the air temperature is 32 deg or below.

runs along the east side of Indiana, Kentucky and Tennessee. The three cities chosen to represent the northern, central, and southern conditions of the region are Chicago, St. Louis and Memphis, respectively. Because of the interior continental location of this region, relatively large temperature fluctuations can be expected. St. Louis, for example, recorded a temperature of 22 deg below zero in January, 1884, and 75 deg in January, 1952. The mean daily minimum for January, however, is 24.6 deg, and the mean daily maximum is 40.3 deg. The mean monthly temperature for January is 32.5 deg. The January mean monthly temperatures for Chicago and Memphis are 25.0 and 41.6 deg respectively.

Obviously Memphis has the mildest and shortest winter, but a temperature of 11 below zero was recorded in February, 1951, and 8 below zero in January, 1918. On the average there are about 45 days per year with minimum temperatures at or below freezing. Such temperatures normally occur in the five month period of November to March.

In Chicago, on the other hand, freezing temperatures can be expected about 110 days per year and about eight days will have sub-zero temperatures. A common misconception of Chicago climate is that winds blow in from Lake Michigan to the city. Actually the prevailing winds approach the city from the southwesterly to a northwesterly direction. As a result, the overall climate is little affected by the lake, and Chicago can be used as a reference for the northern part of the south-east central region.

Days with measurable precipitation are spread uniformly throughout the reason in each of the cities. Both Memphis and St. Louis average 112 days per year with precipitation of .01 of an inch or more. Chicago averages 124 days per year. Since Memphis has the warmest winters more of the winter precipitation is in the form of rain. As a result, the annual precipitation is higher—49 inches per year as compared to 39 for St. Louis and 33 for Chicago.

TABLE 3—DESIGN DATA FOR SNOW MELTING SYSTEMS, SOUTHEAST CENTRAL REGION

City	Design Output, Btu per (Hour) (Sq Ft)		
	Class I System[1]	Class II System[2]	Class III System[3]
Chicago, Ill.	89	165	350
St. Louis, Mo.	122	152	198
Memphis, Tenn.	134	144	212

[1] For Class I (residential) Systems, the design output is set at that required heat output (see Table 2) when $A_r = 0$ at the 98th percentile of the frequency distribution; that is, where 98% of the hours have this output or less.
[2] For Class II (commercial) System, the design output is the maximum output when $A_r = 0$ in Table 2 (last column).
[3] For Class III (industrial) Systems, the design output is determined by the following four requirements: (1) Output is never exceeded for two consecutive hours; (2) Output for $A_r = 1$; Table 2, is at least 1 Btu per hour per sq ft greater than maximum output for $A_r = 0$; (3) A_r is greater than or equal to 0.5 the maximum requirement shown in Table 2 for $A_r = 1$. That is, $q_d = q_s + q_m + 0.5\ (q_e + q_h)$ for the conditions where $q_t = q_s + q_m + q_e + q_o$ are a maximum; (4) The free area ratio A_r is unity for at least 98% of the hours listed in Table 2.

TABLE 4—YEARLY OPERATING DATA, SOUTHEAST CENTRAL REGION

City	Idling			Melting		
	Time,[1] Hr. per Year	Rate,[2] Btu per (Hour) (Sq. Ft.)	Output,[3] Btu per (Year) (Sq. Ft.)	Time,[4] Hr. per Output,[5]	Class	Output[5] Btu per (Year) (Sq. Ft.)
Chicago, Ill.	1848	67.8	125,000	134	I	7200
					II	8390
					III	8700
St. Louis, Mo.	1104	44.8	49,500	33	I	2190
					II	2290
					III	2380
Memphis, Tenn.	454	32.0	14,500	11	I	702
					II	721
					III	792

[1] From Table 2, Column 3 × 3630 (hr per year).
[2] Rate when idling, Btu per (Hr) (Sq Ft) = (0.27V + 3.3) (3.2 — t), where V = wind velocity from Column 5, Table 2, and t = air temperature from Column 4, Table 2.
[3] Product of the two preceding columns.
[4] Hours of Snowfall, from Column 7, Table 2.
[5] Based on the condition that surface temperature is maintained at 33 deg until required output exceeds design output, at which time design output is used regardless of required output. Distribution of required output based on Table 2.

Snowfall varies from light in Memphis to moderate in Chicago, as shown in Table 1. Note that the greatest fall in 24 hours in Memphis was 18 inches, but only 14.9 inches in Chicago. This is not unusual because the snowfall in Memphis is apt to be warm, hence have a high water equivalent. Certainly depths in excess of 10 inches are troublesome, so that all three cities have been crippled by snow on the ground.

Neither St. Louis nor Memphis have frequent snowfalls, as shown by Table 2, but both show fairly heavy falls when there is a snowstorm. Another interesting misconception about Chicago weather concerns the wind velocity. See in Table 2 that all three cities have identical wind velocities for periods of sub-freezing temperature, but no snowfall—11.5 miles per hour in each case.

Table 3 indicates that Class I and Class III systems have design outputs in reverse order; that is, Chicago has the least requirement for a Class I system and the greatest requirement for a Class III system. Just the opposite is true for Memphis. This reversal is due to the air temperature variation with respect to rate of snowfall. Memphis has heavier falls during warmer periods, but Chicago has snow during much lower air temperatures. Remembering that Memphis has had very cold weather, an engineer should be prepared for extreme cases in Memphis, even though the frequency of the extreme is low.

In Table 3 it is shown that the physical size of a Class I system for Chicago would be smaller than that for Memphis. Table 4, however, shows that the operating costs (for the same systems) would be ten times as great in Chicago than in Memphis. This is due, of course, to the *frequency* of use (see Table 2). Even a Class III system in Memphis would have very low operating cost.

In summary, snow melting systems in the South-East Central region vary in practicality depending upon their location. Those in the northern part of the region are almost a necessity, whereas those in the southern sections would be a luxury, except for emergency areas.

(Next month's installment will cover Montana, Wyoming, the western Dakotas and northern Nebraska)

Exhaust System for Forge Presses

What is said to be the most powerful, industrial plant exhaust system in eastern U. S. is being installed in the facility which Wyman-Gordon Co. operates in North Grafton, Mass., for the U. S. Air Force.

The heart of the system will be four scrubbers, air cleaning tanks, 42-feet tall, 10½ feet in diameter and weighing 9½ tons. Two 150-horsepower fans will pull the contaminated air through the system.

The system is aimed at clearing the vicinity of the 50,000-ton and 35,000-ton hydraulic, closed die forge presses which Wyman-Gordon put into production in 1955. They are producing large, close tolerance, aluminum components for military and civilian airplanes.

Air will move through the system at the rate of 130,000 cfm, at a velocity of nearly 4000 fpm. Each tank will use 230 gallons of water an hour from 231 jets. The fog created by the jets, will drive any solid particles, such as oil, to the tank sides and it will be washed into settling tanks. The water will be contained in a 7,000-gallon recirculating system. Some ducts have a diameter of seven feet.

The plant, largest of its kind in the world, now relies on roof openings and floor fans for ventilation.

The scrubbing tanks are being fabricated here by Ken-Weld Co. on a sub contract from Buffalo Forge Company. Prime contract is held by Delbrook Ventilating Co.

Though Ken-Weld and North Grafton are less than five miles apart, the tanks will be delivered by railroad.

Removal of air-borne particulates and allergens by a portable

Electrostatic Precipitator

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Results of extensive tests to determine the collection efficiency of a portable electrostatic filter for various air-borne contaminants. Tests were made at two air flow rates.

AN investigation was conducted to determine the performance characteristics of a new, recirculating type of electrostatic precipitator, available as a small, compact unit designed for applications in hospital rooms or bedrooms of allergy patients.

The most important factor to be ascertained in investigating this unit was its collection efficiency for various air-borne contaminants of differing particle size and physical characteristics. Efficiency was obtained at two specified air flow rates in various size rooms on a number of aerosols and at different humidities and temperatures. This study of the unit was divided into several phases.

1. Performance of the unit was determined independent of its location or room size with usual indoor temperature and humidity conditions (65 to 75 deg F, 40 to 60% relative humidity). This phase included determination of the collection efficiency for the following particulate materials: Atmospheric dust; pollen (a) ambrosia trifida (giant ragweed) 19.6 microns; (b) dactylis glomerata (orchard grass) 31 microns; tobacco smoke (submicron); fly ash (mean size by count 0.6 micron); calcium carbonate; bacteria (M. Candidus). Collection efficiency was determined by weight, stain, and by count, according to the information desired.

Air speeds of 165 and 120 cfm, were used.

2. After completing these tests, collection efficiency was determined for various degrees of dirtiness of the cell and ionizer on atmospheric dust, pollen and tobacco smoke.

3. Other major factors investigated were the physical effects of the environment in which the unit would ordinarily be placed; primarily, the effect of room size, and location and orientation of the precipitator on its performance. Aerosols of atmospheric dust, fly ash and pollen were employed in this phase of the work.

4. The effects of relative humidity on efficiency and the generation of ozone by the unit represented the final phases of the test program.

Operating Characteristics

The electrostatic air cleaner tested in the laboratory was rated at 200 and 150 cfm when operated on a 115-volt, 60-cycle, single phase power supply and had a power consumption of 50 watts.

Figure 1 shows the principal components of the collector. Plate and ionizing sections have been partially withdrawn from the cabinet to indicate their relative location and alignment. Overall collector dimensions, height, width and depth, are 30.5 in. x 15 in. x 15 in., respectively.

Air enters the ionizing section near the base of the collector through a screened 9 in. x 10 in. rectangular entry and discharges at the top through a 9 in. diameter outlet. The high potential ionizing section consists of three 0.008 in. diameter wires spaced symmetrically between two, 1¼ in. ground cylinders and two flat ground plates (on the outer edges of ionizing section).

The collecting section consists of 33 plates (alternate plates charged) with a spacing of 0.8 cm. The plate section is 12 in. long in the direction of air flow and 9 5/16 in. x 10¼ in. in width and depth.

A two-speed, axial-flow fan at the top of the collector

Fig. 1. Tests were conducted on this type of portable electrostatic air cleaner.

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[2] Research Associate.

TABLE I—OZONE GENERATION RATE OF ELECTROSTATIC CLEANER

Test No.	Outlet Concentration of Oxidants as O_3 Parts per 100m*	Ozone Generation cfm x 10^6	Remarks
	(a) At 120 cfm		
1	1.66	1.99	Moderate activity around unit
2	1.92	2.30	Same as above
	(b) At 165 cfm		
3	1.28	2.11	Same as above
4	1.28	2.11	Same as above
5	0.32	0.53	In still air
6	0.38	0.63	Same as above
7	0.38	0.63	Same as above, ionizer cleaned
8	1.14	1.88	Moderate activity around unit
9	0.76	1.25	Same as above

* Parts per hundred million, by volume.
NOTE: During all runs, air temperature and relative humidity were nearly constant, at 77 deg F and 60% r.h., respectively.

draws dirty air (from floor level) through the air cleaning section of the unit.

Air Flow Characteristics

Total air moving capacity was found to be 165 and 120 cfm at high and low fan speeds, somewhat below the 200 and 150 cfm originally ascribed to this model. This was due to technical difficulties in the original fan blade design.

Resistance to Air Flow

Pressure losses through the ionizing and plate sections were quite low at normal flow rates. Static pressures obtained at the exit of the plate section were apparently lower than at the entry. The actual difference (<0.001 in. water) was attributed to static regain resulting from the constriction of the air stream cross section at the entry to the plate section. The major resistance in the unit occurred as an entry loss at the base of the collector and ranged from 0.019 in. water at 120 cfm to 0.025 in. water at 165 cfm.

Voltage and Current Characteristics

Voltage measurements with the electrostatic voltmeter showed ionizing and plate potentials of 8600 and 7000 volts, respectively. The ionizing voltage is near the minimum value (3 to 7 kv per cm.) required to produce a corona discharge. Inspection of the ionizing wires indicated a distinct corona when the unit was examined in a dark room. From a practical point of view, 8600-volt operation should minimize ozone generation. However, in comparing devices of this type, the ion current is the determining factor for ozone production. Our measurements indicated a total ionizing current of 160 microamperes (58 microamperes per foot of wire) which was independent of fan speed.

Results of Ozone Concentration Tests

Table 1 presents ozone generation values for the collector under various operating conditions. Tests 1 through 4 indicate that the generation rate is essentially independent of the system air flow, that is, outlet concentrations vary inversely with air velocity through the ionizer but total emission is nearly constant. At constant air flow (165 cfm) ozone generation rates varied as much as five-fold, depending upon the activity in the room. Arcing increased when dust, stirred from walking near the unit, entered the ionizing section. Since much of the dust generated in this manner bears a charge, the conductivity of the air gap between the wires and cylinders becomes greater. Therefore, ion current increases, which creates more ozone. Tests 6 and 7 show that moderate dust accumulation upon the ionizer wires does not significantly influence ozone generation.

The rate of ozone generation was compared to another commercial precipitator on a basis of data appearing in the 1948 edition of the Industrial Electronics Reference Book since both units were geometrically similar. Expressing the total ion current (160 microamperes positive) in terms of current per foot of ionizing wire, a value of 60 microamperes per foot was obtained. According to the reference book, the predicted ozone concentration leaving the collector (based upon a filtration velocity ⅓ that of the unit compared) should have been 0.36 parts per hundred million. This agrees with values reported in Table 2 for operation in quiet areas.

The average outlet concentration from the unit is about 1.0 part per hundred million which is at the threshold limit of odor and about 0.1, the currently accepted hygiene limit. This value, however, must be interpreted in terms of the increase in concentration which occurs as air is recirculated in a typical room. For example, one may choose an average-size room of 1200 cu ft volume which is sealed very well so that a minimum infiltration rate of 0.5 air change per hour occurs. This is the worst possible condition for the accumulation of ozone to high values. A low mixing efficiency of 50% may also be assumed—again to give the most unfavorable dilution conditions which may be expected. Using these figures and the average generation rate, the maximum concentration which will result in this room (at infinite time) is about

TABLE 2—OZONE CONCENTRATION VARIATION WITH TIME FOR COLLECTOR OPERATION IN A SEALED ROOM

Test No.	Cumulative Time in Cabinet, Hours	Cabinet Concentration, pp100m³	Theoretical Concentration pp100m³
1[3]	16.0	0.55	42.4
2	0.0	0.90[4]	0.90[5]
3	1.0	0.26	3.55
4	2.0	<0.10	6.20
5	3.0	<0.10	8.85
6	23.0	<0.10	61.0
7	46.5	<0.10	123.0
8	115.5	0.32	306.0

(1) Parts per hundred million, by volume.
(2) Based on buildup with no decomposition, 50% mixing efficiency, no infiltration, using generation rate of 0.53×10^{-6} cfm O_3 or 0.38 pp100m (as measured after run 8).
(3) Initial concentratian in cabinet not measured; assumed zero.
(4) Background concentration from previous tests.
(5) Theoretical = Calculated + Background.

TABLE 3—COLLECTOR PERFORMANCE ON ATMOSPHERIC DUST REMOVAL OVER A PERIOD OF 11 DAYS CONTINUOUS OPERATION

Room Temperature, 65-75 deg; Relative Humidity, 40%-60%

Test No.	Day of Test	Condition of Unit	Air Flow, CFM	Stain Tests*		Weight Collection Efficiency	Particle Count Efficiency
				Method	Efficiency		
1	1	Clean	165	NBS	94.0	—	—
2	1	Clean	120	NBS	95.0	—	—
3	2	Clean	165	AISI	99.0	Start wt. test	—
4	4	Clean	165	AISI	98.0	—	—
5	5	Clean	165	AISI	97.1	—	—
6	6	Moderately Clean	165	AISI	95.2	—	—
7	7	Moderately Clean	165	AISI	98.0	—	—
8	7	Moderately Clean	165	—	—	90.0	82
9	7	Moderately Clean	120	—	—	—	86
10	8	Moderately Clean	165	AISI	95.6	—	—
11	9	Dirty	165	AISI	97.8	Start wt. test	—
12	11	Dirty	165	AISI	95.0	—	—
13	13	Dirty	165	AISI	93.6	—	—
14	14	Dirty	165	AISI	90.0	—	—
15	14	Dirty	165	—	—	84.0	—

* Efficiency by National Bureau of Standards method mean of 3-4 tests. Efficiency by AISI method mean of 8-10 two-hour tests upstream and 12-24 hours downstream.

33 parts per hundred million, which is roughly three times the hygienic standard. In some rooms two air changes per hour can occur which would lower the maximum concentration to about 8 parts per hundred million. This value is lower than the accepted hygienic standard but creates a definitely detectable odor which is objectionable to many persons.

In this discussion it was assumed that the ozone concentration would increase in an additive manner without taking into account the decomposition of ozone. Witheridge and Yaglou have pointed out that this decomposition is variable "depending on the characteristics of a room and the air supply system, absolute humidity which appears to be very important, temperature, and possibly other factors that may arise under practical conditions." To determine how this decomposition can affect the theoretical accumulation with time of the ozone concentration, the collector was placed in a sealed chamber of 1200 cu ft volume and run for a total of 115 hours, sampling the chamber concentration periodically. Table 2 shows the measured concentrations for two series of tests, the first for 16 hours and the second for succeeding values up to 115½ hours. For the first series the final concentration was only 1% of the theoretical which should have been reached (method of calculation shown in Table 2). The second series shows a final concentration of less than 0.1% of the theoretical. In fact, ozone concentration actually decreased during this series to values below the sensitivity of analysis (<0.10 parts per hundred million). These values indicate a rate of ozone decomposition which is greater than ozone production. The most important variable effecting this decomposition is the humidity. During these runs the absolute humidity and temperature were 100 grains per lb. dry air and 80 deg., respectively. In a chamber this size, at this humidity it has been found when an equilibrium value of 2.0 parts per hundred million exists, ozone is actually being produced at 120 parts per hundred million. This is over 100 times the equilibrium value. This easily explains why in the actual tests, the equilibrium concentration reached values lower than 30% of the generation concentration. This should not be considered as a safety factor, however, since on extremely dry days ozone decomposition can be negligible and the concentration could then attain high equilibrium values.

The studies indicate that under certain conditions, that is dry days, low room infiltration rate, low mixing efficiency, the ozone concentration resulting from continued operation of this unit could reach values irritating to mucous membranes of the nose and throat. This might necessitate shutting off the unit for permitting intermittent flushing of the room air. In such cases the best detector of ozone is the human nose. The recommended limit for occupied room is 4.0 parts per hundred million which produces a definite odor which is neither pleasant nor objectionable. In fact, at this level there is some value obtained, that is, the masking of body odors. Once the concentration has exceeded this olfactory level, the unit should be turned off until infiltration reduces the concentration to below the olfactory threshold limit (1.0 parts per hundred million).

Efficiency

The following data describe the air cleaning characteristics of the test unit in the range of normal indoor temperatures and humidities (65 to 75 deg, 40 to 60% r.h.) and are independent of its location and the room size. They represent the portable electrostatic unit response to a number of air-borne contaminants varying widely in particle size characteristics, physical composition and concentration. Studies also include operation with the unit ionizing wires and plates thoroughly cleaned and after 11 days accumulation of dust upon the collecting system (following continuous operation at high flow, 165 cfm).

TABLE 4—COLLECTOR EFFICIENCY FOR NATURAL AND SIMULATED AIR-BORNE CONTAMINANTS

Particulate	Particle Size Characteristics			Inlet Concentration	No. of Tests	Efficiency, Per Cent	Air Flow, CFM
	Count Median, (Mg) Microns	Geometric Standard Deviation, (δg)	Mass Median, (Mg') Microns				
Ragweed pollen	19.6	1.07	—	19-3, 100 grains/cu ft	3	99.9+ (Count)	165
Ragweed pollen	19.6	1.07	—	712 grains/ cu ft	1	99.9+ (Count)	120
Orchard grass pollen	31.0	1.10	—	4-45 grains/ cu ft	3	99.9+ (Count)	165
Tobacco smoke	0.25-0.50	—	—	15-22 Mg/M³	4	87.0 (Weight)	165
Tobacco smoke	0.25-0.50	—	—	15-22 Mg/M³	4	91.5 (Weight)	120
NBS fly ash	0.60	2.70	14.6	20 grains/ 1000 cu ft	3	98.6 (Stain)	165
Calcium carbonate	0.62	2.0	2.6	5-30 grains/ 1000 cu ft	3	96.7 (Weight)	165
M. Candidus	0.5-0.7	—	—	340-17, 300 bact./cu ft	4	98.0 (Count)	165

Weight, Stain and Count Efficiencies of Atmospheric Dust

Table 3 summarizes the results of weight, stain and count efficiency tests for typical atmospheric dust concentrations.

Stain data obtained with the clean collector at high air flow (165 cfm) indicated an average efficiency of 94.0% based upon a modified National Bureau of Standards sampling technique. Similar tests at low flow (120 cfm) on atmospheric dust removal were essentially the same as those obtained at 165 cfm. Mean results were 95%. No great improvement was anticipated since the velocity reduction was only about 27%.

Weight efficiencies for atmospheric dust determined with pleated filters over 75 hour periods showed decreased efficiency following 11 days continuous operation, that is 90% (clean) to 84% (dirty).

Particle count efficiencies determined with a light field, were 82 and 86%, respectively for high and low flows (165 and 120 cfm).

Clean versus Dirty Unit

A series of stain tests conducted with an AISI automatic smoke filter (Research Appliance Co., Pittsburgh, Pa.) showed a decrease in efficiency (99-90%) over a 14-day period which included 11 days continuous operation. Although efficiencies determined by collection on this sampler were slightly higher than those obtained by the National Bureau of Standards method (attributed to leakage problems at filter seal) they showed reduced efficiency as the unit became dirty.

The following tests were undertaken to determine collection efficiency with several common air-borne contaminants and simulants like fly ash and calcium carbonate and to show the effect of particle size, concentration and extreme humidities upon collection efficiency. See Table 4.

Pollen Tests

Count efficiency measurements were obtained with two typical pollens, ragweed (Ambrosia trifida, Mg = 19.6 microns, $\delta g = 1.07$) and orchard grass (Dactylis glomerata, Mg = 31 microns, $\delta g = 1.10$). Upstream pollen concentrations ranged from 19 to 3100 individual grains per cu ft. Since no pollen grains, ragweed or orchard grass were detected on any of the downstream samples at high or low flows, pollen removal efficiency was considered 100% for practical purposes, and based upon the highest concentration approaching the collector, 3100 grains per cu ft, was greater than 99.9%.

Pollen tests were run on the unit when the ionizer and plates were dirty (after fly ash tests) and repeated after the unit was thoroughly cleaned. Efficiency in both cases, as reported was greater than 99.9+% within our limits of measurement.

Tobacco Smoke

Weight collection efficiencies for tobacco smoke (mean size 0.3 to 0.5 microns) ranged from 85 to 90% for high flows (165 cfm) and from 91 to 92% for low flow (120 cfm) with average values of 87 and 91.5%, respectively. Collection plates and ionizing section were covered with a dense coating of condensed tars following these tests. During the sampling periods a slight but distinct odor of tobacco smoke was detected in the collector effluent. About eight cigarettes were completely burned during each 30 to 35-minute test.

Fly Ash

Stain efficiency for NBS fly ash (Mg = 0.6 micron, $\delta g = 2.7$) averaged 98.6% at high flow (165 cfm) based upon five tests which ranged from 97.2 to 100% efficiency. Examination of downstream filter circles showed a few visible specks but very little staining.

Calcium Carbonate

Weight efficiency for calcium carbonate (Mg = 0.62 micron, $\delta = 2.0$) determined at high flow (165 cfm) ranged from 95.8 to 97.6% (mean value = 96.7%) on a basis of three tests. Results were similar to fly ash tests and indicated that collection is not greatly affected by particle size.

Bacteria—M. Candidus—High Flow

Efficiency for removal of bacteria was determined with M. (Micrococcus) Candidus. This organism is nonpathogenic and existed in the vegetative state during tests as spherically shaped cells, 0.5 to 0.7 microns in diameter. The effective size parameters based upon the presence of small agglomerates (2 or 3 organisms in a cluster) were 0.6 micron for the median size by count (Mg) and 1.2 for the geometric standard deviation (δg).

Results at 165 cfm indicated efficiencies in the order of 98%. Upstream concentrations ranged from 340 to 17,300 live organisms per cubic foot of air. Effluent concentrations measured were quite low (7 organisms per cubic foot of air).

High collection efficiencies might be expected on a basis of the particle size and would be enhanced by the fact that vegetative cells are destroyed by dehydration. Although test results do not distinguish between natural death rate and per cent of organisms captured upon the plates, the per cent passage in any case appears to be low (2% maximum).

Effect of Humidity Upon Collection

A fly ash aerosol was selected to determine the effect of humidity upon collection efficiency. Tests reported previously at 19% r.h. (74 deg D.B., 52 deg W.B.) showed an average stain efficiency of 98.6%. Stain efficiency at moderately high humidity (86% r.h.) decreased slightly to an average value of 97.5% (96.5 to 98.8%). At maximum humidity (75 deg D.B., 74 deg W.B.—96% r.h.) considerable arcing was noted and the pilot light (which indicates proper plate and ionizing potentials) flashed off and on. A significant decrease was noted in collection efficiency at this condition. Average of three tests, 92.4, 94.6 and 92.6%, showed 93.2% collection efficiency. Absolute humidities for the three series of tests were 22, 110 and 126 grains of moisture per pound of dry air. It appeared that even under extreme humidity conditions, which might result from the use of a vaporizer in a sick room, the unit's collection efficiency would not be seriously impaired.

Effect of Location and Orientation in Room

Most tests discussed essentially refer only to the collection efficiency of the electrostatic cleaner and are independent of room size, and location and orientation of the unit. However, long period stain tests (24 to 48 hours) with atmospheric dust indicated that indoor concentrations, because of infiltration of outside air, reflected consistently the condition of the outside atmosphere as well as the degree of activity within the building. These data are discussed under Effect of Infiltration.

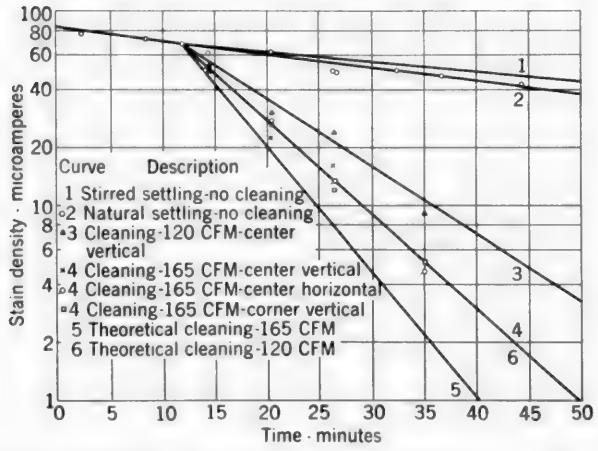

Fig. 2. Cleaning rate for fly-ash aerosol in a sealed chamber.

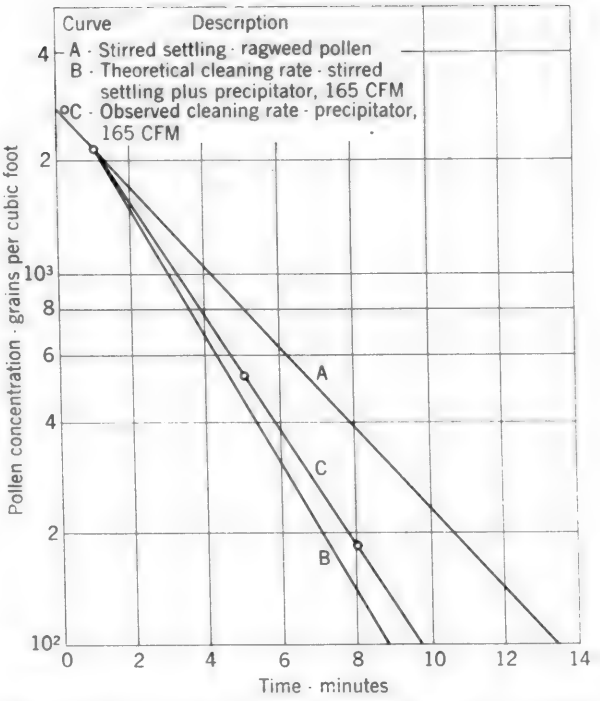
Curve Description
A · Stirred settling · ragweed pollen
B · Theoretical cleaning rate · stirred settling plus precipitator, 165 CFM
C · Observed cleaning rate · precipitator, 165 CFM
Pollen concentration · grains per cubic foot
Time · minutes

Fig. 3. Cleaning rate for ragweed pollen in a sealed chamber.

Experiments were conducted in a sealed, 1200 cu ft capacity dust chamber which was provided with ventilation systems to change or recirculate the air within the room. Sampling pumps and control apparatus were located outside the chamber to prevent contamination of the room atmosphere.

Effect of Air Flow Rate on Performance

Figure 2 indicates that the reduction in cleaning capacity of the collector is related directly to the air flow rate. A comparison of curves 3 and 6 shows that the ratio of theoretical to actual cleaning rate at 120 cfm is 0.715 (0.746 at 165 cfm). It appears that the circulation or mixing efficiency is subject to very little change for operation in nominal size rooms. Figure 3 shows the cleaning rate for ragweed pollen.

Effect of Room Size

The dust cabinet with a total air volume of 1200 cu ft is approximately equivalent to the average bedroom. Ordinarily, the unit would be used only in rooms of this size.

Fly ash tests showed that the ventilation or recirculation efficiency increased slightly with higher air flow rate, 71.5 to 74.6% at 120 and 165 cfm. These data are plotted in Fig. 4, including the known 100% efficiency at zero room volume and may be used to estimate circula-

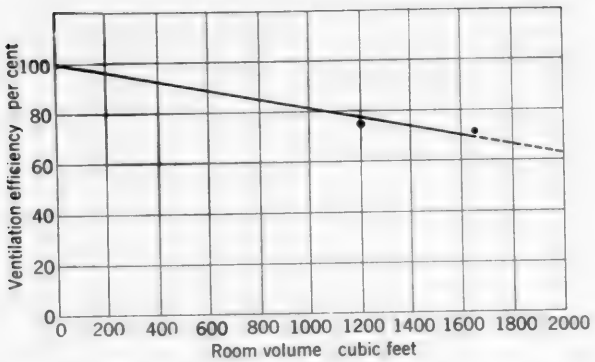

Fig. 4. Effect of room size on ventilation efficiency.

tion efficiency for such room volumes that are up to 2000 cu ft.

Effect of Air Infiltration

Dust cabinet tests describe the collector cleaning characteristics under conditions where no further dust enters the room once tests have started. In actual practice, that is, a typical sick room in a hospital or home, a number of air changes takes place depending upon the degree of closure of the room and the wind velocity. In using this collector, room ventilation should be kept at a minimum (in the range of ½ air change per hour) to obtain maximum cleaning.

Tests with atmospheric dust in a large room area (approximately 7000 cu ft) indicated room stain values ranging from 8 to 114 microamperes for two-hour AISI samples. With no activity in the room, dust concentrations dropped to relatively low values (<0.01 grain per 1000 cu ft). Samples taken at 1 a.m. and 5 a.m., however, increased to high values (0.075 grain per 1000 cu ft), due to the blowing or firing of boilers in the immediate neighborhood. Under these circumstances the cleaning rate could not compete with the degree of contamination at the infiltration rate.

$$C = \frac{Q_i C_i}{Q_i + Q_c}$$

The equation for the limiting dust concentration to be expected in a typical sick room after one hour of collector operation depends only upon the dust concentration in the outside air, C_i, the infiltration rate, Q_i, and the collector cleaning rate, Q_c.

In a tightly closed room, 0.5 air change per hour represents a normal infiltration rate (10 cfm for a 1200 cu ft room). The maximum reduction possible in dust concentration with the collector operating at 165 cfm (assuming 100% efficiency) would be about 94%. If the air change rate increases to two changes per hour (40 cfm for a 1200 cu ft room) the limit in reduction of outside dust concentrations becomes 80.5%. Optimum cleaning can be achieved either by minimizing infiltration or by cleaning directly all air that enters the room.

Conclusions

1. A comprehensive evaluation of the performance of a compact, portable, low-voltage electrostatic precipitator has indicated that mean efficiencies for several representative atmospheric contaminants were as follows:

Atmospheric Dust	Efficiencies, %
Weight	90
Stain	95
Count	82
Pollen	
Ragweed	99.9+
Orchard Grass	99.9+
Tobacco Smoke	91.5
Fly Ash	98.6
Calcium Carbonate	96.7
M. Candidus	98.0

2. It was found that reducing the air flow through the unit caused an increase in efficiency inversely proportional to the velocity through the plates. These data agree with previous studies on precipitator performance. However, efficiencies obtained with the collector were considerably higher because the air velocity through the unit is less than half that normally employed in air conditioning systems.

3. It was observed that a significant reduction in collection efficiency took place when the unit was operated continuously over a two-week period under normal atmospheric dust concentrations. A decrease in efficiency from 99 to 90% resulted.

4. In the range of normal relative humidities (40 to 60%) no appreciable change in efficiency was detected. However, under nearly saturated conditions, considerable arcing occurred and efficiency with fly ash was reduced from 98 to 92%.

5. The performance of the unit was found to be independent of the relative position of the entry of the unit (vertical or horizontal) and location in the room. In a chamber of 1200 cu ft volume, the cleaning rate was independent of entry orientation and location.

6. The effect of the size of the precipitator upon the cleaning rate relative to the room volume can be estimated for room volumes as large as 2000 cu ft. The efficiency of air mixing (diffusion created by the unit) as measured in special dust cabinet tests shows values of ventilation efficiency ranging from 74% in a 1200 cu ft room to 62% in a 2000 cu ft room.

Ozone Concentrations

7. Ozone concentrations measured in the undiluted effluent were found to average 0.010 ppm at high flow (165 cfm) and 0.013 ppm at low air flow (120 cfm). Sealed room tests over periods ranging from 1.0 to 115 hours of continuous operation showed equilibrium concentrations varying from <0.001 ppm to 0.005 ppm at relatively high humidities (100 grains per pound of dry air at 80 deg) when the generation concentration (effluent) averaged 0.003 ppm. This indicates a high decomposition rate for ozone at this humidity. At low humidities, however, the concentration can build up to values much greater than the recommended permissible level for occupied rooms (0.04 ppm).

Acknowledgment

The writers wish to acknowledge the technical assistance of David M. Anderson, Charles E. Billings, Edward Kristal, Julius Marzul and W. David Small in obtaining some of the data in this study.

AIR CONDITIONING, HEATING AND VENTILATING'S

Ventilation of Industrial Ovens

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What is considered good design and operation for industrial ovens used to dry and bake coatings

AIR CONDITIONING, HEATING AND VENTILATING — DECEMBER, 1956

Ventilation of Industrial Ovens

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After a liquid coating is applied to some object, this coating must be dried or baked in an industrial oven. Proper ventilation and design of the ovens are important because of the solvents and vehicles used in order to avoid fires and explosions. This article presents what is considered good design and it also covers proper oven operation. Design data and problem are included.

OVEN drying or the baking of objects coated or impregnated with materials that contain flammable solvents may result in a serious fire and explosion hazard unless adequate ventilation is provided. Safe procedures in both oven design and operation must be followed. Otherwise, the oven, the plant in which the oven is located, and possibly the lives of employees may be put in danger.

In recent years, an increasing use of industrial ovens has magnified this hazard, causing a marked rise in the number of fires and explosions. Therefore, increasing attention has been focused on means that would provide sufficient ventilation and safeguards in oven design and operation so that fire or explosion, due to equipment or man failure, may be prevented. Natural draft or gravity exhaust ventilation must never be used on ovens in which flammable liquids are evaporated. Positive ventilation by means of a fan and motor must always be provided.

While industrial ovens have many applications such as heat treating, annealing and curing, this article deals, in a general way, with ovens that are used to bake or dry a coating on an object, where the coating contains a flammable solvent or vehicle. Not included are details of special safety devices and equipment for such information can be obtained from the National Board of Fire Underwriters, insurance carriers, and manufacturers.

Common Types of Industrial Ovens

There are two main types of ovens: (1) the batch type in which the work is loaded, heated for a period of time, and removed; (2) the conveyor type through which the work passes continuously, entering freshly coated through one opening, and emerging dry through a second opening.

Ovens are usually arranged either with a recirculating system in which a fixed portion of the heated vapor-laden air is continuously recirculated through the oven and the balance exhausted to the outside, or non-recirculating with only continuous exhaust of air from the oven. In *direct-fired ovens*, the source of heat may be in contact with the air within the oven. In *indirect-fired ovens*, an intermediate heat exchanger is used to convey heat from the source to the oven atmosphere. Gas, oil, steam, or electricity are the usual sources of heat. Indirect-fired gas or oil ovens require independent venting of the combustion chamber to remove the products of combustion. In all other cases, the ventilation aspects of oven design are concerned only with the removal of vapors, which in the case of direct-fired gas or oil heated ovens, are intimately mingled with the products of combustion.

Solvent Evaporated Into the Oven

Before ventilation design considerations can be discussed, the amount and nature of the solvents which are evaporated in the oven by the drying process must be known, since ventilation rates will depend entirely on these factors, with one exception to be noted later.

The amount and composition of the solvent present in the coating or impregnating material must be determined, taking into account the amount of thinner added to the original material. This information can usually be obtained from the supplier. In the average dipping process, the coating material may contain up to 50% by volume of solvent. In spray coating, the amount may be as high as 85%. In applications such as fabric coating, the material may contain lower percentages of solvent. A typical baking paint or enamel will contain petroleum naphtha, with some formulations containing toluene or xylene as well. Some processes require a coating material containing mixtures of the aliphatic and aromatic hydrocarbons, various esters, ketones, and alcohols. Thus, fairly accurate information on the ingredients present is important.

A simple and widely used method of estimating the quantity of solvent evaporated is to utilize plant records of coating material used per specified period of time, and the number of oven batches or hours of oven operation in the same period. Knowing the percentage of solvent, a simple calculation will yield pints of solvent per batch or per hour of oven operation. Another method of determining solvent use involves a weighing of the amount of solids deposited per unit of surface area and calculating back to the original coating material. The increased accuracy of this method is not usually sufficient to warrant the trouble involved unless the information is also desired for operational purposes.

These figures will err on the safe side since it is not

the usual practice to take into account the amount of material and solvent lost between the coating operation and the entrance into the oven. This material lost is so difficult to estimate that it is usually ignored, and in most cases, this will not significantly reduce the amount of ventilation required.

The difference between the solvent in the coating material as applied and that on the work reaching the oven may arise from a number of conditions, as follows:

Overspray. This will depend to a large extent on the spraying technique and the size and shape of the work being sprayed. With good technique, the over-spray for large flat surfaces may be as low as 10%, that is, 10% of the material leaving the spray gun does not reach the work. For small or open surfaced objects, the overspray may be as high as 40% to 80%.

Dipping. In dipping, especially with low viscosity substances, there will be some material dripping from the object as it is raised from the tank. Some of this will drip back into the tank but a portion will drip on to the drainboard or floor before reaching the oven. The amount will depend on so many variables that it cannot be estimated with accuracy.

Evaporation. There will be an inevitable evaporative loss of solvent between the time the article is coated and the time it reaches the oven. This will depend on the coating process, ambient temperature, distance from oven, speed of conveyor travel, amount of incidental or operational preliminary air drying, thickness of coat, evaporation rate, ambient room air velocity, and other factors.

As previously stated, these pre-oven losses are so difficult to estimate with any degree of accuracy that they are usually ignored. In cases where they may be large enough to affect the required oven heat capacity and ventilation rates drastically, they may be considered, but extreme precaution must be observed because to overestimate the pre-oven solvent losses in the design of oven ventilation may introduce a serious fire and explosion hazard.

Where a mixture of solvents is present, such as in a lacquer, the ventilation required for the resultant mixture of vapors cannot be determined by a calculation of the air quantity required by each component and then adding the figures. Mingling of different vapors will result in an indeterminate lower explosive limit for the mixture. Although formulas are available for the calculation of the lower explosive limit of a mixture, these are not accurate for solvent vapor mixtures and the usual recommended procedure is to calculate the air quantity per pint for each component of the mixture and assume that the entire mixture consists of the component requiring the largest air quantity per pint.

Ventilation

Oven ventilation has two safety functions: (1) to dilute the vapor concentration within all parts of the oven to well below the lower explosive limit, especially at peak evaporation rates; (2) to provide a sufficient air velocity into all operating openings of the oven to prevent vapors from escaping into the workroom. Ventilation rates must be calculated from both of these standpoints and the larger amount used. The latter air quantity is derived by a simple multiplication of the area of all operating openings by the required velocity, usually 50 to 100 fpm.

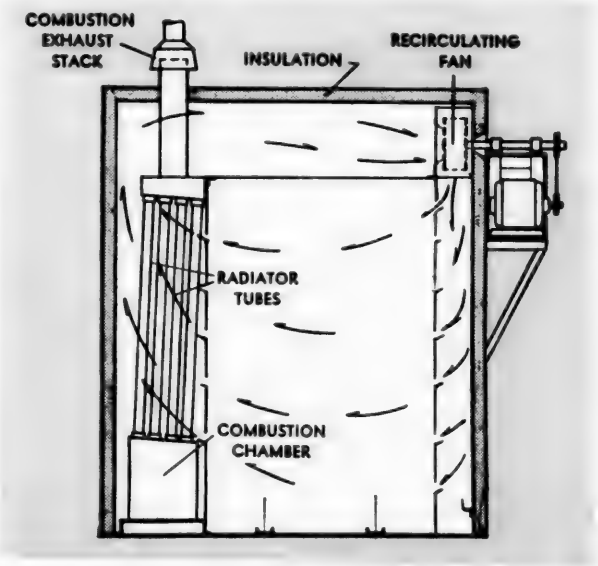
In determining dilution ventilation, it is first necessary to establish the amount of solvent which will be evaporated in the oven, as described in the previous section. The air quantity required to dilute this amount to a certain safe percentage of the lower explosive limit can then be calculated from the following formula which is based on Avogadro's number at standard temperature and pressure (1 atmosphere at 70 deg F)

$$\text{(1) Cubic feet of air per pound} = \frac{(386)\ (100)\ (C)}{(MW)\ (LEL)}$$

or

$$\text{(2) Cubic feet of air per pint} = \frac{(403)\ (\text{Sp.Gr.})\ (100)\ (C)}{(MW)\ (LEL)}$$

where 386 is Avogadro's number
403, in combination with the specific gravity (sp.gr.), converts pounds to pints



Indirect fired recirculating oven. Illustration courtesy of W. S. Rockwell Co.

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Benjamin Feiner, a graduate of City College of New York, has been associated with the Division of Industrial Hygiene, New York State Department of Labor, for 16 years. Formerly, he was chief of field service, for the first New York City Air Pollution Survey. From 1947 to 1949 he was adjunct instructor in industrial hygiene engineering at Columbia University, School of Public Health. He has lectured at industrial ventilation conferences held at Columbia, Syracuse and Buffalo universities and Rensselaer Polytechnic Institute, and is technical consultant, Professional Examination Service, American Public Health Association. He is a member of American Conference of Governmental Industrial Hygienists and was a member of the committee which prepared that group's Industrial Ventilation Manual.

Irving Kingsley, industrial hygiene engineer, has been with the Division of Industrial Hygiene, New York State Department of Labor for the past 6 years. He has the following degrees: B.S. in Chemistry, City College of New York; M.S. in Industrial Hygiene, Columbia University; and a B.Ch.E. from New York University. He is a member of the American Industrial Hygiene Association.

MW is the molecular weight of the liquid
LEL is lower explosive limit in per cent by volume
C is a safety factor to be discussed under "Specific Oven Types"

Table 1 lists the physical constants to be used for some of the common solvents as well as ventilation rates calculated using the equation without the *C* factor.

This air quantity, referred to 70 deg, is multiplied by the amount of solvent evaporated in the oven (in pounds or pints per minute) to give cubic feet per minute (cfm). This cfm is multiplied by the ratio of absolute temperatures to give cfm at the elevated oven temperature and is the quantity the fan will be required to move. The temperature-volume correction is usually ignored for temperatures up to 100 deg.

An additional correction to the calculated air quantity may have to be made to provide for the decrease in the lower explosive limits at elevated temperatures. Most data on lower explosive limits have been derived at 70 deg. Where information about the decrease in the limit with increasing temperatures is unavailable for a particular solvent, the cfm calculated as indicated may be used for temperatures up to 250 deg. Where operating temperatures are between 250 and 500 deg, this air volume should be increased by a factor of 1.4.

Using this corrected air quantity, pipe and fan sizes are selected on the usual basis of a pipe velocity of 1500 to 2500 fpm. For high temperature and all direct-fired oven applications, the backwardly curved or radial fan is used because of the corrosion resistant properties of the heavy wheel in these fans.

In order to select the proper fan speed and horsepower, the system resistance must be calculated. Since the friction charts and other standard resistance data are based on 70 deg air, the resistance may be calculated using pipe velocities at the corrected air quantity. Bear in mind that this is technically erroneous since the air is at an elevated temperature and thus has a lower density. Assuming, for purposes of discussion, 1000 cfm, at 250 deg, at a pipe velocity of 2000 fpm, the resistance calculated using standard data sources will be actually that of a system moving 1000 cfm, at a pipe velocity of 2000 fpm, but at 70 deg.

Reference can then be made to the fan multi-rating tables (which are also at 70 deg) and a fan speed and horsepower selected for the resistance of the system assuming 1000 cfm, 2000 fpm pipe velocity, and 70 deg temperature. Since the system is actually at 250 deg,

TABLE 1 — PROPERTIES OF COMMON FLAMMABLE AND TOXIC SOLVENTS

Name	Mol. Wt.	Specific Gravity	Flash Pt Deg F	LEL (1) Per Cent per Vol.	Boiling Point, Deg F	Evap. Rate	MAC, PPM (2)	Cu Ft Air per Pint Solvent for Dilution Below LEL (3)	Cu Ft Air per Pint Solvent for Dilution Below MAC (4)
Acetone	58	0.79	0	2.2	134	Fast	1000	210 × C	5,500 × K
n-Amyl acetate	130	0.88	77	1.1	300	Slow	200	244 × C	13,600 × K
Benzol (benzene)	78	0.88	12	1.4	176	Fast	35	290 × C	(5)
n-Butanol (butyl alcohol)	74	0.81	100	1.7	243	Slow	100	254 × C	(5)
n-Butyl acetate	116	0.88	72	1.7	260	Medium	200	177 × C	15,300 × K
Butyl cellosolve	118	0.90	141	—	340	Nil	200	—	15,400 × K
Carbon tetrachloride	154	1.60	None	None	170	Fast	25	Non-flam	(5)
Cellosolve	90	0.93	104	2.6	275	Slow	200	156 × C	20,800 × K
Cellosolve acetate	132	0.98	124	1.7	313	Slow	100	168 × C	20,970 × K
Chloroform	119	1.48	None	None	142	Fast	100	Non-flam	50,200 × K
1-2 Dichlorethylene	97	1.29	43	9.7	141	Fast	200	50 × C	26,900 × K
Ethyl acetate	88	0.90	24	2.2	171	Fast	400	184 × C	10,300 × K
Ethyl alcohol (ethanol)	46	0.79	55	3.4	173	Fast	1000	193 × C	6,900 × K
Ethyl ether	74	0.71	—49	1.9	95	Fast	400	205 × C	9,630 × K
Ethylene dichloride (1-2 dichloroethane)	99	1.26	56	6.2	181	Fast	100	77 × C	(5)
Methyl acetate	74	0.92	14	4.1	140	Fast	200	118 × C	25,000 × K
Methyl alcohol (methanol)	32	0.79	52	6.0	147	Fast	200	156 × C	49,100 × K
Methyl isobutyl ketone	100	0.80	73	—	244	Medium	100	—	32,300 × K
Methyl cellosolve	76	0.97	105	—	255	Nil	25	—	(5)
Methyl cellosolve acetate	118	1.00	132	—	289	Nil	25	—	(5)
Methyl chloroform (1, 1, 1 trichloroethane)	133	1.33	None	None	165	Fast	500	Non-flam	8,070 × K
Methyl ethyl ketone (2-butanone)	72	0.81	30	1.8	176	Fast	250	250 × C	18,200 × K
Methyl propyl ketone	86	0.82	60	1.6	216	Medium	200	236 × C	19,000 × K
Methylene chloride (dichloromethane)	85	1.34	None	None	104	Fast	500	Non-flam	12,750 × K
Monochlorobenzene	113	1.11	85	1.8	270	Medium	75	218 × C	5,290 × K
Naphtha (petroleum)									
Low boiling (140F-206F)	—	0.70	50	0.9	—	Fast	500	344 × C	7,000 × K
Medium boiling (196F-250F)	—	0.73	50	to	—	Fast	500	313 × C	6,000 × K
High boiling (217F-288F)	—	0.76	100	1.3	—	Medium	500	282 × C	5,400 × K
Safety Solvent (300F-400F)	—	0.80	100-110		—	Slow	500	250 × C	4,600 × K
Perchloroethylene (tetrachloroethylene)	166	1.62	None	None	249	Medium	200	Non-flam	19,800 × K
iso-Propyl alcohol	60	0.79	53	2.5	181	Fast	400	206 × C	13,200 × K
iso-Propyl acetate	102	0.89	40	1.8	194	Fast	200	192 × C	17,500 × K
Toluol (toluene)	92	0.87	40	1.3	232	Medium	200	295 × C	19,000 × K
Trichloroethylene	131	1.47	None	None	189	Fast	200	Non-flam	22,500 × K
Xylol (xylene)	106	0.88	63	1.0	291	Medium	200	332 × C	16,500 × K

(1) Lower Explosive Limit.
(2) Maximum Acceptable Concentration, subject to revision. This is a hygienic standard referring to allowable concentration of vapor in the worker's breathing zone.
(3) Ventilation rate must be multiplied by the following factors: (a) Temperature—volume factor—(oven temp., F+460)/530, (b) Factor of safety, C, (C=4 for continuous process ovens and 10 for batch ovens. Where the peak evaporation rate in the latter is known, this rate is multiplied by a factor of safety of 4, instead of using 10 times the evaporation rate), (c) LEL correction factor of 1.4 for ovens between 250 deg and 500 deg.
(4) Ventilation rate must be multiplied by a factor *K*, that varies from 3 to 10.
(5) Local exhaust ventilation required. General ventilation cannot be relied upon to provide adequate control for these more toxic solvents.

the calculated resistance and the horsepower selected from the fan tables may be reduced by the ratio of density of air at 250 deg to density of air at 70 deg. The speed does not change, since, according to the fan laws, a fan at a constant speed is a constant volume machine and the cfm at that speed does not vary with the density. Thus at a given rpm, the cfm will remain constant regardless of a change in density or temperature. Brake horsepower does change. In terms of the hypothetical problem, the fan selected to maintain 1000 cfm in a system at 2000 fpm pipe velocity and 70 deg air temperature will maintain the same 1000 cfm and 2000 fpm pipe velocity at 250 deg air temperature, although resistance and brake horsepower will decrease.

This artificial device permits the calculation of a system using existing data, and theoretically the horsepower selected may be reduced as described. However, this is not usually possible from a practical standpoint, for when the oven is started, the fan, which is a constant volume machine, will initially handle the calculated air quantity at 70 deg; with the temperature gradually rising until the oven is up to heat, the increased horsepower will be required until that time.

To return to the hypothetical problem, at oven start-up, during cold conditions, the fan will have to handle 1000 cfm, at 2000 fpm pipe velocity and at 70 deg and the horsepower originally taken from the fan tables will be utilized. As the oven warms up and air density decreases, then the brake horsepower of the fan will decrease accordingly.

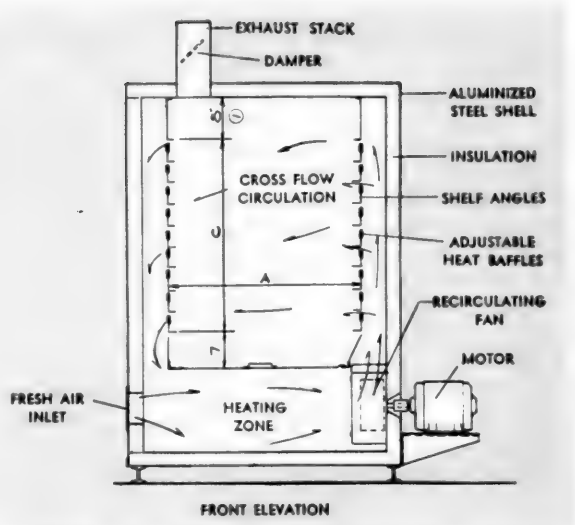
In large installations, where horsepower requirements are large, the difference between brake horsepower needs at cold start-up conditions and at elevated operating temperatures, may represent a considerable capital investment. In such cases, motors selected to satisfy the reduced brake horsepower needs at the elevated temperature may be used provided they are of the variable speed type. Thus, they may be operated at lowered speeds during oven start-up so that the exhausted cold air quantity is lower and the required horsepower does not rise above the capacity of the motors. Otherwise, motor burnout may occur.

Batch Oven

The most common industrial oven is the batch oven. In its barest essentials, it consists of a heated cabinet into which a load of work is introduced, dried, and then removed. These may be recirculating or non-recirculating, direct- or indirect-fired, and gas, oil, steam or electrically heated. Probably the most widely used batch oven is the indirect gas-fired, recirculating oven with continuous exhaust by a common or separate exhaust fan.

The total amount of solvent to be evaporated per batch may be determined as previously described. However, an additional factor must be considered—the peak evaporation rate. When a load of freshly coated work is introduced into a hot oven, the evaporation rate in gallons per minute will rise rapidly to a peak in the first five to ten minutes and will then fall off sharply as the more volatile components are evaporated and as the coating becomes dry.

For dipped metal under average conditions, the evaporative process is such, that in typical one hour batches,



Batch type direct fired recirculating oven. Illustration courtesy of W. S. Rockwell Co.

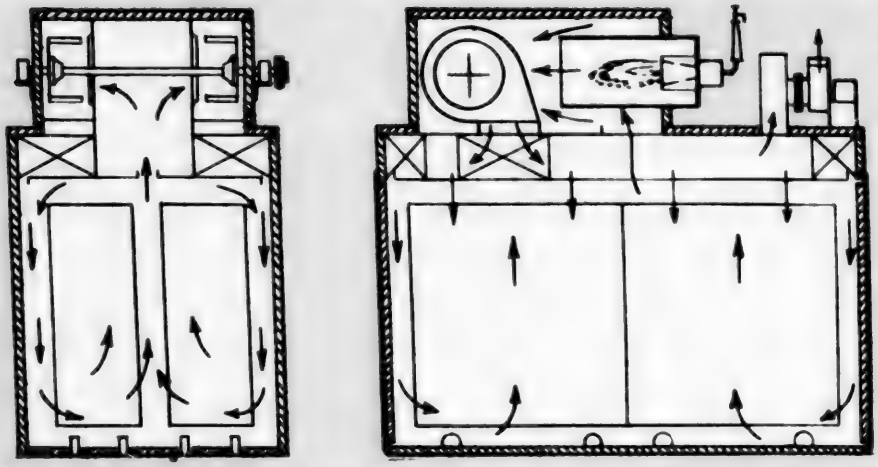
all the volatiles are evaporated in the first 20 minutes.

The peak evaporation rate, which occurs from four to eight minutes after loading, is approximately three times the average evaporation rate. For the typical solvent used in a dip coating process, the National Board of Fire Underwriters recommends ventilation at 380 cfm (referred to 70 deg) per gallon of solvent to maintain safe conditions at the peak rate. This rate is based mainly on empirical data and in most cases will maintain vapor concentrations during periods of peak evaporation at or near the LEL. This will be equivalent to an average concentration of approximately ⅓ of the LEL over the entire evaporation period.

A safer method would be to ventilate at a rate four times this NBFU recommended figure so as to maintain the usual one-fourth of the LEL ($C = 4$ in equation) at the peak rate when ignition is most likely.

For all work other than dipped metal, the 380 cfm per gallon figure cannot be used. If the peak evaporation rate can be determined, ventilation must be maintained to keep the oven atmosphere at one-fourth of the LEL during these peak evaporation rates. When the peak rate cannot be determined, and this will usually be the case, the average rate of evaporation is determined as discussed. In these instances, ventilation must be designed on the basis of maintaining an average vapor concentration of one-tenth of the LEL ($C = 10$ in equation). This is necessary to insure a maximum of one-fourth of the LEL during the unknown peak conditions of operation.

In designing ventilation for batch ovens, make-up air inlets and recirculating vents must be arranged to provide for a continuous flow of fresh air into all parts of the oven. Indirect-fired ovens require an independent vent to remove gaseous products of combustion. Direct fired ovens must be ventilated so as to prevent local accumulations of explosive concentrations near a flame or exposed heating element. Where fuel consumption in direct-fired ovens is high, the calculated air volume must be increased by the volume of gaseous products of combustion.



Batch type oven with a direct fired, gas heated recirculating system and independent exhaust fan. Illustrations courtesy of Lydon Brothers, Inc.

Continuous Ovens

In the group of continuous ovens are included all conveyorized drying processes where the coated or impregnated work continuously enters one end, passes through the heating zone, and emerges dried at the other end. Automatic dipping or spray coating and drying processes, paper coating machines, cloth coating or impregnating processes, and plastic printing machines fall into this category. Heating may be by one of the common methods and the design is usually of the indirect-fired, recirculating type although in some cases the recirculated air is direct-fired outside of the oven.

Continuous oven ventilation should be designed so that all the fresh make-up air continuously enters the enclosure through the work entrance opening and traverses over the entire heating zone until it is exhausted from the dry end of the oven. In long tunnel ovens and cloth coating machine dryers, with numerous access doors, these doors must be kept closed during operations to prevent short-circuiting of air away from the drying zone at the entrance of the oven and possible build-up of vapors in this zone.

Since the average evaporation rate will be constant and continuous for the entire oven, ventilation may be provided to dilute the average vapor concentration to one-fourth of the LEL.

In a number of continuous ovens, particularly for cloth coating machines, the nature of the different products manufactured is such that conditions will vary due to different coating materials used, different concentrations of material in the solvent, varying thickness of coat applied, changing temperatures, and adjustable conveyor speeds. Under these circumstances, ventilation should be provided to satisfy the worst possible conditions.

It has also been found useful to install continuous vapor concentration indicators and controls calibrated in terms of percentage of the lower explosive limit. The sampling probes of these indicators are located near the entrance of the oven at the zone of highest vapor concentrations. It is common practice to set the control to actuate an alarm or turn the heat off when the concentration at this point, based on experience, exceeds 40% of the LEL. This will be equivalent to an average concentration below 25% of the LEL.

In many instances, these indicators are being used as an additional safeguard since the conveyor speed can be adjusted and maintained at such a rate that 40% of the LEL is not reached. However, it must be borne in mind that these devices are very sensitive and may be inaccurate. They must be carefully calibrated and adjusted, zeroed (adjust zero reading) with fresh air every day, serviced frequently, and must always be used as a check on the ventilation and not as a sole means of determining safe operations.

Air Seal

Many continuous ovens, in which the work enters and leaves through openings in the same end, are provided with a modification of design known as an air seal, which is designed to save heat.

These are usually provided at ovens processing large pieces of work where the entrance and exit openings are so large that the ventilation rate required for maintaining safe atmosphere within the oven are not high enough to maintain controlling velocities through the large area of openings. Sufficient rates to maintain these controlling velocities would require an uneconomical increase in heating capacity to maintain heat in the oven.

The air seal is a vestibule attached to the end of the oven where the work enters and leaves. This is presumed to act as an expansion chamber in which the air leaving the oven proper can cool and contract. If this occurs to a sufficient degree, the air quantity required to maintain a controlling velocity through the vestibule openings will accordingly be much less than that required to maintain a controlling velocity into the oven proper, since, in the latter case, the air quantity must also be enough to overcome the expanding hot air leaving the oven.

A number of designs to accomplish this end are possible. Usually, the inlet of an exhaust fan of much greater capacity than required to maintain the LEL is connected to the vestibule. The discharge of this fan is connected to a Y which is arranged so that the air quantity required to maintain the LEL in the oven is continuously exhausted, while the remainder of the air is recirculated back to the vestibule. This recirculated air is supposed to accommodate the spill of hot air from the oven, while

the exhausted air, which is designed to maintain safe atmospheres in the oven, is made up through the vestibule openings, thereby maintaining an inward air flow into the latter.

The danger in this type of arrangement is that in usual practice the exhausted air is taken from the open end of the oven and the only vapor that it will contain is that which finds its way out of the oven with the emerging expanding air. This results in a possibility of building up pockets of vapor of explosive concentrations in the rear of the oven where there will be little or no air movement. This can be overcome by arranging the ductwork so that all the continuously exhausted air is taken from the rear of the oven. This will force the dilution air to traverse the entire oven before being exhausted so that continuously the atmosphere in all parts of the oven will be diluted to safe levels.

Safeguards and Interlocks

There are a number of safety requirements which are applicable to all ovens covered by this discussion. Automatic interlocks must be provided to ensure continuous operation of the recirculating and exhaust fans during oven operation, since failure of the ventilation during such operation could result in fire or explosion in a short period of time. Some of the more common precautions follow:

1. The exhaust and recirculating fans should be interlocked with the heat supply so that the latter cannot operate unless the fans are operating and maintaining the required air flows. These controls should preferably be of the positive air flow switch type rather than rotational or electrical interlock, since a loose fan key, broken fan belt, corroded fan blades, or plugged ductwork will permit the operation of the fan motor even though little or no air is flowing. It is recommended that, in addition, rotational switches be provided as an extra precaution against failure of air flow switches. Electrical interlock may be used on direct drive fans. These additional safeguards are particularly recommended for recirculating fans, since there may arise a condition where an air flow switch on an inoperative recirculating fan may be kept open by the pressure induced in the system by the still operating exhaust fan, resulting in local build-up of vapors.

2. Where exhaust and recirculation is performed by a single fan with suitable volume control dampers in the ducts, the dampers must be carefully adjusted and riveted in position. A stop should be provided to prevent accidental or intentional full closure. The dampers should never be manipulated to increase the temperature. It is recommended that dampers be reduced in size so that the required quantity of air is maintained in the full closed position.

3. Where separate fans are used, suitable air volumes should, if possible, be achieved by proper design of the fan and ducts and not by dampers. Where dampers are used, suitable safeguards as indicated should be provided.

4. There should be a sufficient number of suitably sized and located air inlets to the oven, protected against manipulation. Dampers should be designed as in items 2 and 3. Where air supply fans are used, the precautions outlined for exhaust and recirculating fans should be observed.

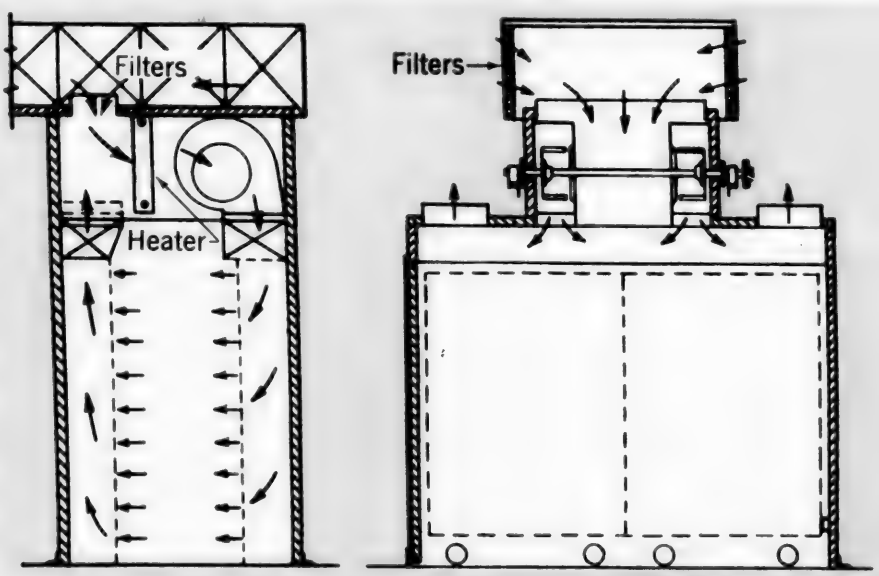
5. The oven must be designed with an automatic pre-ventilation period to purge the oven before it is started and before it is re-started after a shut-down for any reason. This purge period can be interlocked with a door or damper switch actuated when the door or damper is wide open to introduce increased quantities of air to the oven during pre-ventilation.

6. In continuous ovens, the flow of work into the oven must be interlocked with the fans, so that work cannot enter the oven unless the proper air flows are being maintained.

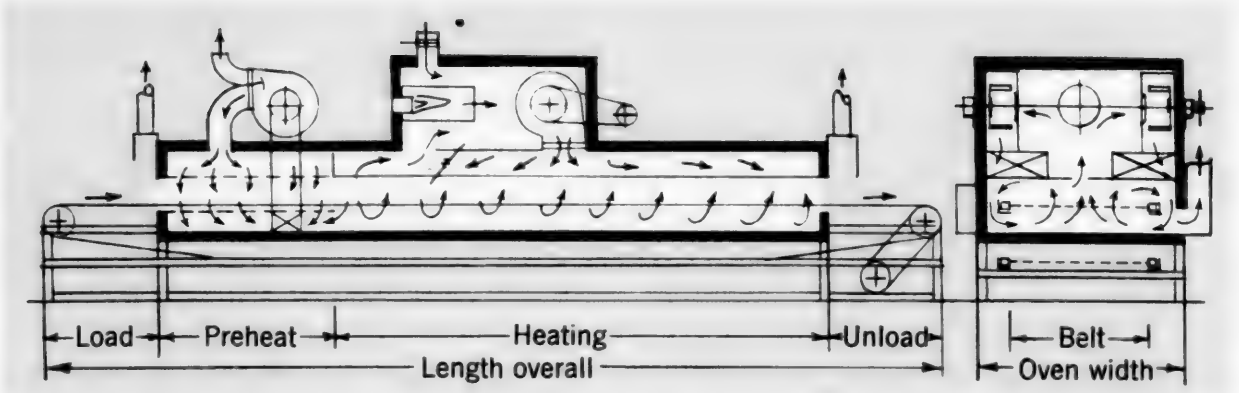
7. Systems should be designed so that the ductwork is as short and free of elbows as possible and takes the most direct possible route to the outdoors.

8. Oven exhaust should not be connected to any other exhaust system.

9. Except for special cases, products of combustion from indirect fired ovens should be vented independently



Batch type direct fired non-recirculating oven with continuous exhaust to outside. Illustration courtesy of Lydon Brothers, Inc.



Continuous conveyor type oven with independent exhaust fan and external hoods and openings. Illustration courtesy of Lydon Brothers, Inc.

and not into the oven exhaust system.

10. Other pertinent safety features include:

(a) Gas or oil-fired ovens should be provided with an automatic safety pilot lights designed to prevent flow of gas in the pilot and burners unless the flame is on and to shut flow of gas if the flame is extinguished. They must be rapid in operation. An observation port for visual examination of both pilot and burners is useful.

(b) A low pressure cut-off valve should be installed in the fuel line to prevent flow of gas when the pressure is insufficient.

(c) Combustion safeguards should be provided.

11. The following temperature controls should be provided:

(a) Temperature indicating device.

(b) Thermostatic control to maintain constant temperature.

(c) Excess temperature cut-off switch.

12. Suitably designed explosion relief vents should be provided, preferably on the top.

13. The gas or oil fuel line should be interlocked with the combustion air line.

14. Reactivation of the heat supply after any shutdown must be by a manual re-set.

15. All controls, interlocks, switches, etc. must be carefully selected for durability, accuracy, sensitivity, rapid operation, and ease of maintenance and checking. A regular maintenance cleaning and adjustment schedule should be provided.

Special Oven Types

Two special oven types have been developed for drying and baking automobiles which have been sprayed with enamel in garage and repair shop spray booths.

Automobile Infra Red Baking Oven

These are traveling infra-red ovens, set on a track, and stored in a chamber attached to the rear of an automobile spray booth. At the conclusion of spraying, the rear doors are opened, and the oven, which consists of banks of infra-red bulbs on a frame silhouetted to enclose the car, travels up and down the spray booth in which the freshly painted car is located. The spray booth exhaust fan, the capacity of which is greatly in excess of that required to maintain safe vapor level limits during baking, is used to ventilate the process.

This oven operation requires special interlocks and safeguards as follows:

1. A pre-ventilation period before energizing the oven to purge the booth of residual overspray and vapor from the spraying operation.

2. An interlock so that the spray gun cannot operate when the oven chamber door is open, when the oven is energized, or when the oven is in the booth.

3. An interlock so that the oven cannot operate unless the exhaust fan is on. The exhaust fan safeguard should be of the air flow type.

Automobile Gas Fired Baking Oven

This is an oven attached in series to a spray booth. Where the oven is provided with an independent exhaust fan, the usual batch oven safeguards apply with the additional requirement that the gas line must be interlocked with the air-tight door between the oven and the spray booth so that gas cannot flow unless the door is closed. Interlocks must be provided between the door and spray gun as well.

The spray booth fan must never be used to ventilate the oven. An independent oven exhaust fan must be provided.

Change in Operating Conditions

Ovens must be designed to meet a particular set of conditions. Many fires and explosions occur as a result of changing these conditions without making the necessary changes in the oven ventilation and safety features. The worst conditions to be encountered in a particular oven operation must be used as a design basis, and a suitable placard or warning notice placed on the oven outlining these conditions.

Any change in these conditions will cause a change in the nature and amount or rate of solvent evaporated into the oven. The following may cause increased solvent evaporation.

1. Elevation in temperature.

2. Increase in amount of coated work in a batch or per unit time.

3. Increase in thickness of coating.
4. Increase in conveyor speed.
5. Change in size or surface area of work.
6. Change in solvent or coating material. An increase in the amount of solvent in coating material per batch or per unit time will of course require increased ventilation. However, a change in type of solvent in coating material, even if the amounts used are the same, will always require a re-evaluation of the oven ventilation rates. Such a new solvent may have a lower LEL than the original and this will require increased exhaust air quantities. Even if the new solvent has the same LEL and is used in the same amount as the original, it may have a lower molecular weight and will require increased exhaust air quantities. The reasons for this will be apparent upon examination of Equation 1 and 2 for the required cfm. Since molecular weight appears in the denominator, a lowered molecular weight will increase the cfm.
7. Change in physical shape of the work. A coated object with a high surface area to mass ratio may result in a much higher peak evaporation rate and higher average rate of evaporation than one with a low surface area to mass ratio.
8. Change in physical nature of work. Solvent evaporation rates from a coated metal object, which has an impervious surface, will be less than from a coated object with higher absorption or porosity characteristics such as fiber or wood. This is particularly true when an impregnated object is baked in an oven designed for a coated object. A recent explosion and fatality resulted from just such a change in process.

All of the previous factors may result in a condition in which the existing ventilation will be inadequate.

Sample Solution

The following illustration is included to demonstrate the use of the ventilation equations as well as some of the other design considerations for oven ventilation.

Problem. An indirect fired batch oven operating at 350 deg is used to bake metal articles for one hour. These articles are sprayed with a paint containing 50% volatiles as xylene. Paint is sprayed at the rate of 3 gal per batch. The amount of paint oversprayed is 25%. Assume a 10% loss of solvent between time of spraying and entry into oven. The peak evaporation rate in the oven is $\frac{1}{8}$ gallon of solvent per minute per gallon of solvent in the batch.

Determine the ventilation rate to maintain solvent vapor concentrations within the oven at not more than 25% of the lower explosive limit:

Solution. The net amount of solvent on the work entering the oven must be determined, taking into account the amount of solvent in the original coating material, and the amount lost by overspray and evaporation. In this case, the solvent content is 50% and the amount of spray applied to the work is 100% — 25% or 75%. Since there is a 10% loss of solvent during evaporation, the amount of solvent remaining is 90%. Then solving we find:

Solvent in the batch entering oven =
(3 gal/hr) (1 hr/batch) (0.5) (0.75) (0.9) = 1 gal.

Peak evaporation rate = ($\frac{1}{8}$ gpm) (1) = $\frac{1}{8}$ gpm = 1 pint per minute

Use Equation (2).

Cubic foot of air per pint of solvent =

$$\frac{(403)\,(\text{sp gr})\,(100)\,(C)}{(\text{mol wt})\,(\text{LEL})}$$

The following constants for xylene are obtained from Table 1:

Sp gr = 0.88 Mol wt = 106
LEL = 1% at 70 deg C = 4

Cfm at 1 pint xylene per minute =

$$\frac{(1)\,(403)\,(0.88)\,(100)\,(4)}{(106)\,(1)} = 1340 \text{ cfm at 70 deg}$$

Cfm at operating conditions (350 deg) =

$$(1340)\,\frac{(460 + 350)}{(460 + 70)} = 2050 \text{ cfm}$$

Correction for decrease in LEL at 350 deg =
(2050 cfm) (1.4) = 2870 cfm at 350 deg

In this equation, 1.4 is obtained from foot note *c*, Table 1.

The pipe sizes and system resistance are determined on the basis of 2870 cfm and the fan static pressure calculated. The fan rating tables are entered at this cfm and static pressure, and the fan speed and motor horsepower are thus obtained.

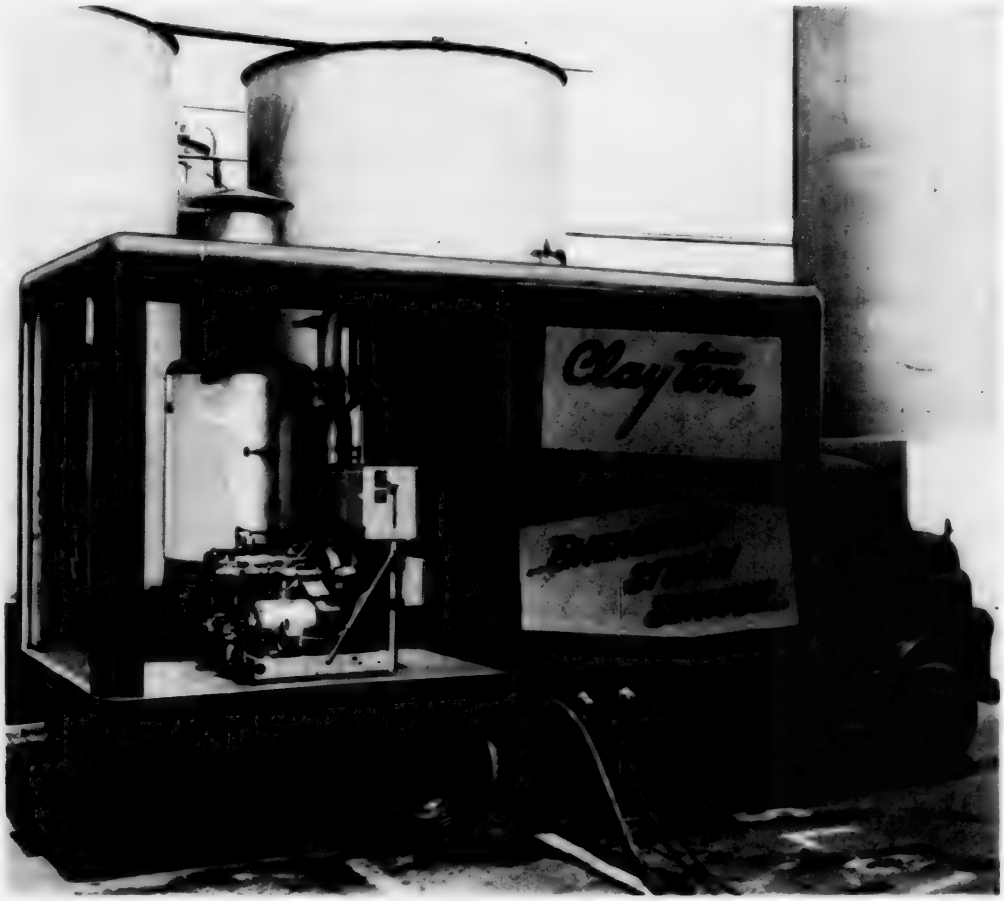
Summary

An industrial oven is much more than a heated enclosure which can be put together by any sheet metal worker. It should be carefully designed, not only from the standpoint of operational efficiency but also from the standpoint of safety, by a person or concern experienced in the field, taking all factors into account. Oven operation and maintenance should be under the direct supervision of skilled and informed supervisory personnel. Any contemplated change in operation, whether in the coating or impregnating process or in the oven itself, should be carefully analyzed by an experienced engineer. One final note of caution: in New York City, and possibly in other cities as well, industrial ovens are required to bear an approval number. This approval relates only to the design and safeguarding of the fuel burners, heating elements, and related factors. It is not an approval of the ventilation or for the use of the oven for a particular operation.

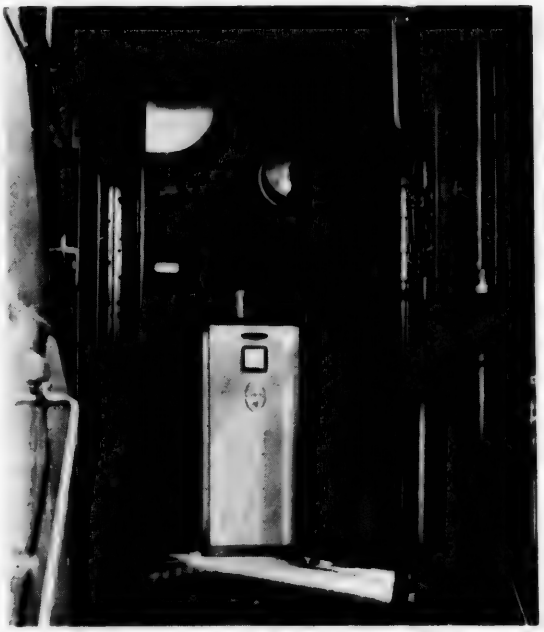
"Climate Van", opened to 16 ft width (above), exhibits Worthington air conditioning and heating equipment to the trade and general public. Cutaways, equipment with glass-paneled fronts, and transparencies (right) show how company's units fit into new or existing buildings. Two of these rolling showrooms tour the country. Each has a registration desk that doubles as a projection booth for slide film show and a sound movie, and a built-in sound system.

PICTURE PARAGRAPHS

Some Wheels in Our Industry



Temporary steam service in the event of boiler breakdowns and steam failures is supplied by 100 hp mobile generator, a product of Clayton Mfg. Co., El Monte, Calif. Within 5 min. pressure is up to 150 psig. Flexible hose connections are employed throughout.



Three special Great Northern business and instruction cars are heated with gas-fired hot water heaters. Model 26 Bryant (Div. of Carrier Corp.) boiler is shown at left installed in air brake instruction classroom. Shown above, parked at siding, the mobile schoolhouse uses boiler when train-line steam is not available. Heated anti-freeze solution is circulatd through car's piping by electric pump. When rolling, train-line steam heats solution through cylindrical heat exchanger shown above boiler.

Buckley M. Byers, acting chief of A. M. Byers Co., Pittsburgh, manufacturer of wrought iron, views his grandfather's name on new Pullman car of Pennsylvania Railroad's *The Pittsburgher*. Alexander M. Byers founded the firm in 1864. Similarly honored were twenty-one other Pittsburgh pioneers.

Disc jockey Don King of station WBML, Macon, Ga., established a new record by broadcasting continuously for 124 hours from this Volkswagon mobile studio, temporarily air conditioned by a Carrier ¾-ton International room unit. Electric power from a model home furnished electricity for air conditioner and radio equipment. Filters in unit kept recordings free of dust and dirt.

How Temperature and Altitude Affect Fan Selection

A. N. ROGERS

Sales Development Section, Westinghouse Electric Corp., Hyde Park, Mass.

Since the density of air is definitely a variable, it is apparent that factors such as temperature and altitude which affect the density of air, will also have a bearing on fan selection. The engineering aspects of these relationships are presented for a better understanding of conditions that are encountered in practice.

ONCE the fundamental concepts of fan operation under varying density conditions are understood, the mystery of fan selection is dissolved.

A point to remember is that basically, fans are constant volume machines. Regardless of the density of the fluid being handled, the volume will remain the same. If a fan wheel is considered as consisting of a series of buckets or scoops of a given capacity, each scoop will then handle a constant volume each time the wheel rotates. Whether the wheel is handling an extremely light gas or a very heavy fluid, the volume handled for each revolution will remain unchanged.

At the same time, however, it is more difficult to "lift" a fluid of heavy density than one of low density. Hence, the head or pressure developed will be greater with the heavier or more dense fluid. Actually, the pressure produced by a fan varies directly as the density—that is, if the density were doubled the pressure would double. Because the work required to move the same volume will vary with the pressure, the power consumed will be greater for the more dense material. Therefore, considering the fan only, for a given fan size and rpm the volume handled will be constant regardless of gas density, but the pressure produced and the horsepower required will vary directly as the density. Referring to Fig. 1, the solid curve represents fan performance at standard conditions and the broken curve the performance at one half the standard density. Note that the volumetric capacity remains the same but at the lower density the pressure and power curves are reduced to one half the original values.

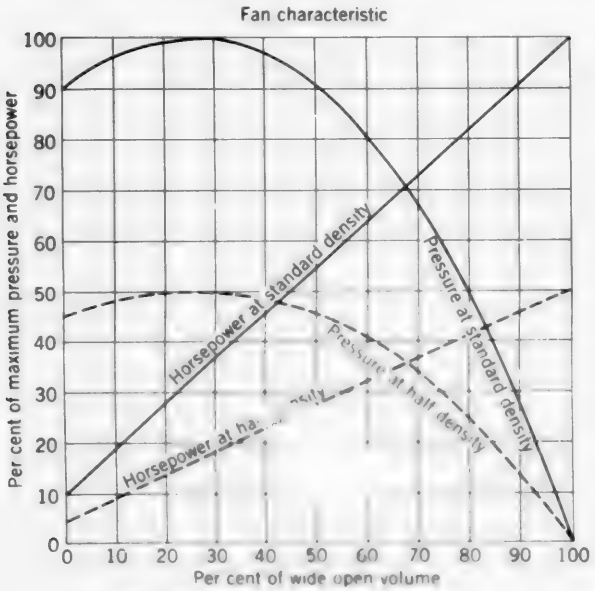


Fig. 1. Fan characteristic curves.

System Characteristics

In normal application the fan is not operating by itself, and the system on which the fan is operating must be taken into account. This system may consist of duct work, coils or other forms of resistance through which the fan must move the fluid. With no fluid moving through the system there is no resistance; and the more fluid that is put through the system, the higher the resistance will become. In most systems consisting mainly of frictional resistance, the pressure or friction loss varies approximately as the square of the volume. In other words, if the volume through the system is doubled, the pressure required to move this volume will be increased four times. A system curve of pressure required versus volume flow may now be drawn. The friction of the gas moving through the system will vary directly as the density. With a heavy dense fluid the friction will be high and with a light fluid it will be low. Therefore, if the density is reduced by one half, the pressure required to move the same volume through the system would be reduced by one half. Figure 2 illustrates a typical system curve at standard density conditions (solid line) and at one half the standard density (broken line).

Fan and the System

Combining the curve of Figs. 1 and 2, the operation of the fan and system as a unit is visualized. The point of operation for a fan on a given system is the intersection of the fan curve and the system curve. Figure 3 shows the fan operating on a system at standard density conditions and with the density cut in half. Both fan pressure and fan power curves are reduced for the lower density and the system curve is also reduced by an equal amount. Thus, the point of operation of the fan and the system for either density condition is equivalent. Because the point of operation is equivalent, the fan efficiency remains constant. From the foregoing, therefore, a fan is connected to a system running at standard conditions and the density of the air is changed by heating

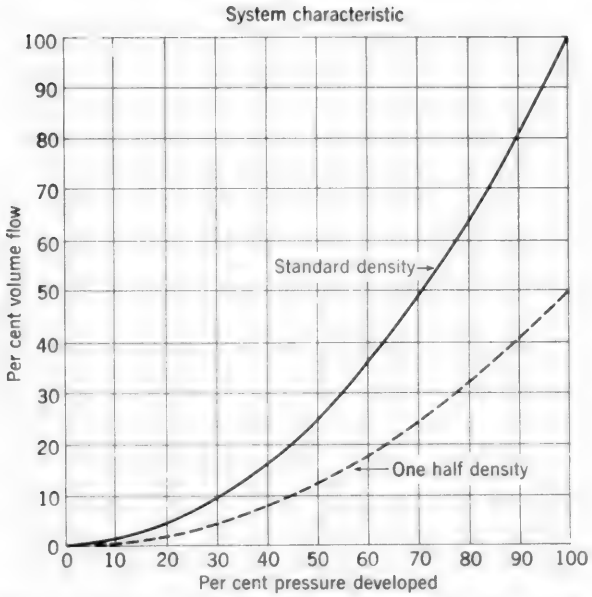


Fig. 2. Typical system curve at standard density conditions and at one half the standard density.

or otherwise, the volume handled through the system will remain unchanged; but both the pressure required (by the system) and that produced (by the fan) will be reduced, and the power required by the fan will be proportionately reduced.

Standard Practice

The air handling industry has established a standard for air density of 0.075 pounds per cubic foot. This corresponds to dry air at plus 70 deg F and 29.92 inches mercury barometer. Fan selection tables, duct friction charts, resistance and data for related equipment are published based on standard density conditions. For the great majority of air handling applications, this value of 0.075 is close enough to conditions of actual service so that no correction is required.

In practice, however, fans frequently handle gases or mixtures of gases other than air—or air at reduced elevated temperatures. In these instances the effect of density is a very important consideration. For example, if standard air is heated to 600 deg to facilitate a drying operation, the density is cut in half and the required fan horsepower is reduced proportionately. Even in the selection of ventilation equipment for high altitude areas, such as Denver, Col., the lowered density due to altitude may make possible a reduction in motor size.

Air Density

The density of air, or any gas, is directly proportional to the absolute pressure and inversely proportional to the absolute temperature, that is, the higher the pressure the greater the density—and the higher the temperature the lower the density. Because in fan work the pressure and horsepower are proportional to the density as referred to standard conditions, it is easier to work with the density ratio.

$$\text{Density ratio} = \frac{\text{Density of Gas Handled}}{\text{Density at Standard Conditions}}$$

$$\text{or} \frac{\text{Density of Gas Handled}}{0.075}$$

When dealing with air; the density ratio will be the same as the inverse temperature and direct volume ratio. Shown as a formula:

$$\text{Density Ratio} = \frac{\text{Temp. Absolute at 70 deg}}{\text{Temp. Absolute Required}} \times \frac{\text{Pressure Absolute Required}}{\text{Pressure Absolute Sea Level}}$$

$$= \frac{460 + 70}{460 + T} \times \frac{P}{29.92}$$

Absolute temperature on the Fahrenheit scale (or degrees Rankine) is 460 plus the temperature in degrees F. For example, the ratio to standard conditions for air at 1000 ft altitude (28.86 in. Hg.) and at 200 degrees F would be:

$$\frac{460 + 70}{460 + 200} \times \frac{28.86 \text{ in. Hg}}{29.92 \text{ in. Hg}} = 0.774 \text{ ratio}$$

For convenience, Table 1 gives air density ratios for air at various temperature and altitude conditions.

Although seldom used, the density ratio increases rapidly at low temperature. At 0 deg at sea level, for instance, the ratio is

$$\frac{460 + 70}{460 + 0} = 1.152.$$

Therefore, when the temperature drops to zero, the fan will require 15% more horsepower than at 70 deg.

Fan Selection

When the system designer is making the fan selection, the procedure is extremely simple. Once the volume required is known, the system resistance is calculated from standard data. This gives the volume and pressure required at standard density conditions. Then, a fan is selected from the fan manufacturer's published data to operate at these working conditions. The pressure actually developed when this fan is in operation will be the pressure at standard conditions times the density ratio. The horsepower required will be the horsepower shown in the manufacturer's data times the density ratio. The volume and rpm given in the tables will be unchanged.

As an example, suppose that a fan is required to furnish 10,000 cfm at 1000 ft altitude and 200 deg F. The system resistance calculated for standard conditions is five inches static pressure and the density ratio is 0.774. From a typical industrial fan catalog we find that a size *A* fan will supply 10,000 cfm at five inches static pressure when running at 1020 rpm and that it will require 12.8 hp. Therefore, when operating at 200 deg and 1000 ft altitude, the pressure actually developed on the system will be five inches $\times$ 0.774 = 3.87 inches and the

About the Author

Arthur N. Rogers graduated from Northeastern University in January 1948 with a BS degree in Mechanical Engineering. During cooperative work assignments and summers, he gained experience with the B. F. Sturtevant Company in the drafting room, dust laboratory and Works Engineering Department. In 1948 he joined Westinghouse-Sturtevant Division and attended the Sales Engineering School. Since then he has had assignments in the Precipitron Department, Mechanical Contractor Sales Department, Heat Transfer Product Section, General Purpose Fan Section, and at present is a Division Sales Engineer in the Sales Development Section.

power required will be $12.8 \times 0.774 = 9.9$ Bhp.

Occasionally the system resistance pressure might be known for the ultimate density conditions. By dividing the pressure by the density ratio, the pressure required at standard conditions can be found

$$\text{SP standard condition} = \frac{\text{SP actual cond.}}{\text{Density ratio}}$$

The fan selection is then made as described.

It should be mentioned that most systems designed for high temperature operation will be handling gas of a higher density during the warm-up period. Unless inlet vanes, dampers or other means of volume control are provided to reduce the volume, and thus the horsepower requirement during this period, the fan must be powered for the highest density condition to be encountered. Otherwise the motor may be seriously overloaded during warm up.

Constant Weight Required

Safety ventilation systems where noxious fumes must be diluted, and process or combustion systems where a given quantity of gas is required, often necessitate the supply of an equivalent weight of gas as would be available at standard conditions. This means that at elevated temperatures a greater volume of air or gas must be handled by the fan to supply the equivalent (by weight) of the volume at standard conditions. In this case, to find the volume required, divide the volume required at standard conditions by the density ratio to find the volume required at the actual conditions. The system resistance is figured and the fan selected for the volume required at the actual conditions.

$$\text{Volume at required condition} = \frac{\text{Vol. std. cond.}}{\text{Density ratio}}$$

For example, if it takes thirteen pounds of air to burn a pound of coal,

$$\frac{13 \text{ lb}}{.075 \text{ cu ft per lb}} = 173 \text{ cu ft}$$

of air are required at standard conditions. If the air to be supplied is 600 deg, density ratio 0.5, then

$$\frac{173}{0.5} = 346 \text{ cu ft of air are required}$$

Mechanical Considerations

It is generally in high temperature applications that the purely mechanical aspects of the fan itself enter the picture to any great extent. The higher the temperature of the gases being handled, the more important the physical considerations become.

Fan Arrangements

The first step to consider is the arrangement of the fan itself. For temperatures above 150 deg, it is mandatory to use an open inlet arrangement—that is, bearings should not be located in the inlet of the fan. This automatically eliminates double width, double inlet fans (except where inlet boxes and bearings mounted on independent pedestals are used.) When fans are to be direct connected, the fan wheel cannot be counted on the motor shaft (Arr. 4) at temperatures above 150 deg without specially lubricated bearings. A temperature of 250 deg is the absolute maximum for this arrangement even with special motor bearings.

Normally, AMCA Arr. 1 or Arr. 9 fans are recom-

TABLE I — AIR DENSITY RATIOS AT VARIOUS ALTITUDES AND AIR TEMPERATURES

Air Temperature, Deg	Altitude in Feet Above Sea Level												
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	15000	20000
	Barometric Pressure in Inches												
	29.92	28.86	27.82	26.81	25.84	24.89	23.98	23.09	22.22	21.38	20.58	16.88	13.75
70	1.000	.964	.930	.896	.864	.832	.801	.772	.743	.714	.688	.564	.460
100	.946	.912	.880	.848	.818	.787	.758	.730	.703	.676	.651	.534	.435
150	.869	.838	.808	.770	.751	.723	.696	.671	.646	.620	.598	.490	.400
200	.803	.774	.747	.720	.694	.668	.643	.620	.596	.573	.552	.453	.369
250	.747	.720	.694	.669	.645	.622	.598	.576	.555	.533	.514	.421	.344
300	.697	.672	.648	.624	.604	.580	.558	.538	.518	.498	.480	.393	.321
350	.654	.631	.608	.586	.565	.544	.524	.505	.486	.467	.450	.369	.301
400	.616	.594	.573	.552	.532	.513	.493	.476	.458	.440	.424	.347	.283
450	.582	.561	.542	.522	.503	.484	.466	.449	.433	.416	.401	.328	.268
500	.552	.532	.513	.495	.477	.459	.442	.426	.410	.394	.380	.311	.254
550	.525	.506	.488	.470	.454	.437	.421	.405	.390	.375	.361	.296	.242
600	.500	.482	.465	.448	.432	.416	.400	.386	.372	.352	.344	.282	.230
650	.477	.460	.444	.427	.412	.397	.382	.368	.354	.341	.328	.269	.219
700	.457	.441	.425	.410	.395	.380	.366	.353	.340	.326	.315	.258	.210

Unity basis equals standard air density of .075 lb per cu ft. At sea level (29.92 in. barometric pressure) this is equivalent to dry air at 70 deg F. Density directly proportional to barometric pressure established by the U. S. Standard Atmosphere-Altitude-Pressure relation. (Bureau of Standards Publication No. 82.) Density inversely proportional to absolute temperature.

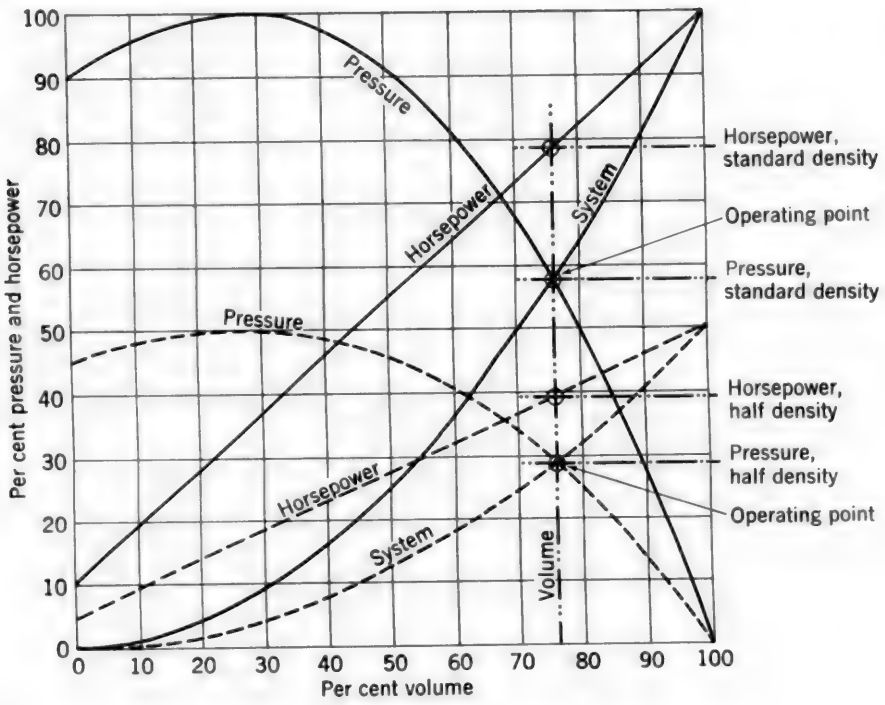


Fig. 3. Fan operation on a system at standard density conditions and at one half density.

mended for a V-belt drive or Arr. 8 for direct connection when fans are to handle gases at elevated temperature. These arrangements, Fig. 4 and Table 2, can generally be used for temperatures up to 300 to 350 deg without modification when ball bearings are employed.

Bearings

The cooling of the fan bearings becomes a problem when gas temperatures rise above 300 to 350 deg. In fact, uncooled sleeve bearings are not normally used above 150 deg. In the past, water cooled sleeve bearings were widely used for high temperature fans. In this type of bearing, the oil is cooled by a continuous circulation of water through a jacket surrounding the oil reservoir or the sleeve. Water cooled sleeve bearings are still popular for heavy duty applications. Air cooled sleeve bearings which are cooled by an external supply of forced air rather than water are also available.

With the increased popularity of anti-friction bearings in recent years, ball and roller bearings are now finding wide use in high temperature fan applications. A cooling wheel, mounted on the fan shaft between the fan housing and the innermost bearing, is generally sufficient for fan handling gases up to 800 or 900 deg. The cooling wheel fulfills several functions simultaneously: It provides a radiation shield between the hot fan housing and the bearing; it conducts heat traveling through the fan shaft and dissipates it into the surrounding air; and finally, it creates a circulation of cool ambient air around the bearing itself. A properly designed cooling wheel guard will not only provide a safety feature, to prevent accidental contact with the rotating wheel, but will also help the cooling wheel provide a better circulation over the bearing. The one disadvantage of the cooling wheel is that it provides little or no protection for the bearing when the fan is shut down.

With present day improvements in lubricants, it is possible to use grease-lubricated bearings for much higher temperature than previously possible. Oil lubricated bearings are superior, however, in that the oil provides a circulating bath to which the balls or rollers transfer their heat. Also oil does not have as great a tendency to build up heat due to internal friction.

To allow the fan shaft to expand and contract due to changing temperatures, one of the fan bearings should be of the floating type. This enables the shaft to expand through the bearing to eliminate the stresses which would be built up if the shaft were held rigidly in place at both ends.

If the fan is subjected to elevated temperatures when not in operation, either water cooled sleeve or anti-friction bearings should be used. Oil lubricated ball or roller bearings can be water cooled either by a jacketed end cap or a coil in the oil reservoir. This type of bearing is also useful when high ambient temperatures are encountered.

Strength of Materials

As temperatures increase, a point is reached when the strength of steel begins to fall off rapidly. Depending upon the alloy involved, this falling off point may be as low as 300 or up to 600 deg and beyond. The fan wheel is the critical item in this regard, and depending on the design and materials, the maximum permissible fan rpm must be reduced when temperature rises above a critical maximum.

The modulus of elasticity of the shaft usually starts falling off at a much lower temperature (about 100 deg) than the yield strength. This means the shaft is subjected to greater deflection thereby lowering the critical speed. The magnitude of this reduction is comparatively

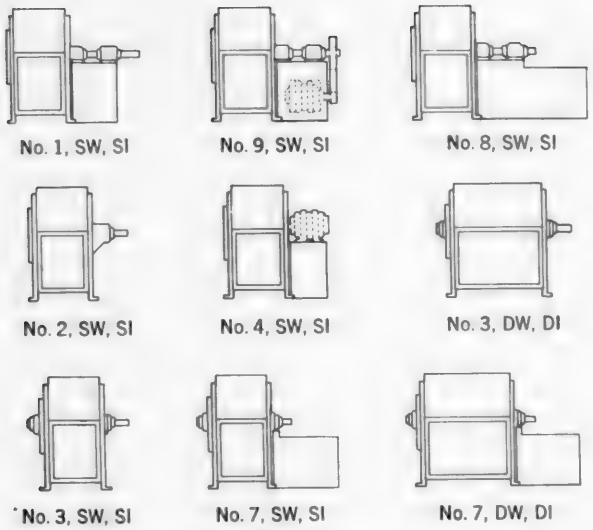


Fig. 4. Various arrangements for fan drives.

small. Because of the lower critical speed of the shaft, the maximum rotating speed must be reduced by a compensating amount.

When fans must be run at high speeds at elevated temperatures, wheels can be constructed of high strength alloys or alloys which are less subject to strength reduction at high temperatures. To overcome the critical speed reduction, oversize shaft and bearings can be substituted.

Maximum and Minimum Temperatures

Fans of standard construction modified for high temperature application are limited to temperatures of 300 to 900 deg maximum. Above this range the problems become acute and special designs are required which are specifically adapted to this type of service. High temperature alloys, special shaft construction, and bearing supports independent of the fan housing are generally incorporated into these special designs. Special wheel designs to eliminate uneven expansion during warm up may also be necessary.

TABLE 2 — ARRANGEMENT OF DRIVE

This Table is to be Used in Conjunction with Fig. 4*

Arrangement Number	Type Fan	Comments
1	SW, SI	For belt drive or direct connection. Wheel overhung. Two bearings on base.
2	SW, SI	For belt drive or direct connection. Wheel overhung. Bearings in bracket supported by fan housing.
3	SW, SI	For belt drive or direct connection. One bearing on each side and supported by fan housing. Not recommended in sizes 27 in. dia wheel and smaller.
3	DW, DI	For belt drive or direct connection. One bearing on each side and supported by fan housing.
4	SW, SI	For direct drive. Wheel overhung on prime mover shaft. No bearings on fan. Base mounted or an integrally direct connected prime mover.
7	SW, SI	For belt drive or direct connection. Arrangement No. 3 plus base for prime mover. Not recommended in sizes 27 in. dia and smaller.
7	DW, DI	For belt drive or direct connection. Arrangement No. 3 plus base for prime mover.
8	SW, SI	For belt drive or direct connection. Arrangement No. 1 plus base for prime mover.
9	SW, SI	For belt drive. Arrangement No. 1 designed for mounting prime mover on side of base.

* Data from copyrighted Bulletin No. 110, Air Moving & Conditioning Association. SW = single width fan; SI = single inlet; DW = double width; DI = double inlet.

Fan applications at unusually low temperatures are seldom encountered. Yet applications do arise in some process work on in the supply of refrigerated air for test purposes and research. The minimum temperature for standard fans is about —20 deg. Although the strength of steel increases at lower temperatures it becomes increasingly brittle. The addition of small amounts of nickel to steel helps the low temperature ductility, or aluminum may be used for the rotating element. Special low temperature lubricants are required for the bearings.

Energy Resources of the United States

About 430 Btu per sq ft per hr of energy is available from the sun's rays which could supply 30 times the present day power production in the United States, according to Ralph L. Brown, fuels technologist of the Bureau of Mines in a paper entitled "Energy Resources of the United States," presented before the Fifth World Power Conference in Vienna.

Mr. Brown went on to say that another estimate is about 50 horsepower per acre from average sunlight in Arizona. He said that a recent meeting of leading workers in the field has summarized unpublished deliberations in assessing the status of the field in the following words: "No great achievements of practical value were reported in the attack on the problem of utilizing solar energy, and it was generally agreed that no new era of direct utilization of solar energy is yet in sight."

According to Mr. Brown, the coal industry in the United States has made outstanding progress in mechanization and productivity over the past eight years. Productivity has increased from 5.82 metric tons per man-day in 1947 to 8.17 metric tons per man-day in 1954. In connection with mechanization, Mr. Brown pointed out that in 1947 69.4% of the coal mined in the U. S. was mechanically loaded, whereas in 1954 this percentage was 88.4. Similarly, mechanical cleaning was used to the extent of 27.7% of the total coal mined in 1947 increased to 57.1% in 1954.

The bituminous-coal industry has thus quietly accomplished in the last decade a technological revolution in American coal mining which is continuing and is improving its position in the continuing competition for fuel markets, he said.

The anthracite segment of the coal industry, more vulnerable by reason of costs and geological conditions, has also begun its adjustments to changed fuel-market conditions and mining practices.

SATURATION PROPERTIES OF FREON-12

(Continued)

Temperature, Deg. F.	Pressure, Lb. per Sq. In.		Volume, Cu. Ft. per Lb.		Density, Lb. per Cu. Ft.		Enthalpy, Btu per Lb.			Entropy, Btu per Lb. per Deg. Abs.	
	Abs.	Gage	Liq.	Vapor	Liq.	Vapor	Liq.	Latent	Vapor	Liq.	Vapor
125	183.76	169.06	0.013308	0.21791	75.145	4.5891	37.275	51.698	88.973	0.073800	0.16222
126	186.10	171.40	0.013335	0.21497	74.991	4.6518	37.529	51.515	89.044	0.074225	0.16218
127	188.47	173.77	0.013363	0.21207	74.836	4.7153	37.785	51.330	89.115	0.074650	0.16214
128	190.86	176.16	0.013390	0.20922	74.680	4.7796	38.040	51.144	89.184	0.075075	0.16210
129	193.27	178.57	0.013419	0.20641	74.524	4.8448	38.296	50.957	89.253	0.075501	0.16206
130	195.71	181.01	0.013447	0.20364	74.367	4.9107	38.953	50.768	89.321	0.075927	0.16202
131	198.16	183.46	0.013476	0.20091	74.209	4.9775	38.811	50.578	89.389	0.076353	0.16198
132	200.64	185.94	0.013504	0.19821	74.050	5.0451	39.069	50.387	89.456	0.076779	0.16194
133	203.15	188.45	0.013534	0.19556	73.890	5.1136	39.328	50.194	89.522	0.077206	0.16189
134	205.67	190.97	0.013563	0.19294	73.729	5.1829	39.588	50.000	89.588	0.077633	0.16185
135	208.22	193.52	0.013593	0.19036	73.568	5.2532	39.848	49.805	89.653	0.078061	0.16181
136	210.79	196.09	0.013623	0.18782	73.406	5.3244	40.110	49.608	89.718	0.078489	0.16177
137	213.39	198.69	0.013653	0.18531	73.243	5.3965	40.372	49.409	89.781	0.078917	0.16172
138	216.01	201.31	0.013684	0.18283	73.079	5.4695	40.634	49.210	89.844	0.079346	0.16168
139	218.65	203.95	0.013715	0.18039	72.914	5.5435	40.898	49.008	89.906	0.079775	0.16163
140	221.32	206.62	0.013746	0.17799	72.748	5.6184	41.162	48.805	89.967	0.080205	0.16159
141	224.00	209.30	0.013778	0.17561	72.581	5.6944	41.427	48.601	90.028	0.080635	0.16154
142	226.72	212.02	0.013810	0.17327	72.413	5.7713	41.693	48.394	90.087	0.081065	0.16150
143	229.46	214.76	0.013842	0.17096	72.244	5.8493	41.959	48.187	90.146	0.081497	0.16145
144	232.22	217.52	0.013874	0.16868	72.075	5.9283	42.227	47.977	90.204	0.081928	0.16140
145	235.00	220.30	0.013907	0.16644	71.904	6.0083	42.495	47.766	90.261	0.082361	0.16135
146	237.82	223.12	0.013941	0.16422	71.732	6.0895	42.765	47.553	90.318	0.082794	0.16130
147	240.65	225.95	0.013974	0.16203	71.559	6.1717	43.035	47.338	90.373	0.083227	0.16125
148	243.51	228.81	0.014008	0.15987	71.386	6.2551	43.306	47.122	90.428	0.083661	0.16120
149	246.40	231.70	0.014043	0.15774	71.211	6.3395	43.578	46.904	90.482	0.084096	0.16115
150	249.31	234.61	0.014078	0.15564	71.035	6.4252	43.850	46.684	90.534	0.084531	0.16110
151	252.24	237.54	0.014113	0.15356	70.857	6.5120	44.124	46.462	90.586	0.084967	0.16105
152	255.20	240.50	0.014148	0.15151	70.679	6.6001	44.399	46.238	90.637	0.085404	0.16099
153	258.19	243.49	0.014184	0.14949	70.500	6.6893	44.675	46.012	90.687	0.085842	0.16094
154	261.20	246.50	0.014221	0.14750	70.319	6.7799	44.951	45.784	90.735	0.086280	0.16088
155	264.24	249.54	0.014258	0.14552	70.137	6.8717	45.229	45.554	90.783	0.086719	0.16083
156	267.30	252.60	0.014295	0.14358	69.954	6.9648	45.508	45.322	90.830	0.087159	0.16077
157	270.39	255.69	0.014333	0.14166	69.770	7.0592	45.787	45.088	90.875	0.087600	0.16071
158	273.51	258.81	0.014371	0.13976	69.584	7.1551	46.068	44.852	90.920	0.088041	0.16065
159	276.65	261.95	0.014410	0.13789	69.397	7.2523	46.350	44.614	90.964	0.088484	0.16059
160	279.82	265.12	0.014449	0.13604	69.209	7.3509	46.633	44.373	91.006	0.088927	0.16053
161	283.02	268.32	0.014489	0.13421	69.019	7.4510	46.917	44.130	91.047	0.089371	0.16047
162	286.24	271.54	0.014529	0.13241	68.828	7.5525	47.202	43.885	91.087	0.089817	0.16040
163	289.49	274.79	0.014570	0.13062	68.635	7.6556	47.489	43.637	91.126	0.090263	0.16034
164	292.77	278.07	0.014611	0.12886	68.441	7.7602	47.777	43.386	91.163	0.090710	0.16027
165	296.07	281.37	0.014653	0.12712	68.245	7.8665	48.065	43.134	91.199	0.091159	0.16021
166	299.40	284.70	0.014695	0.12540	68.048	7.9743	48.355	42.879	91.234	0.091608	0.16014
167	302.76	288.06	0.014738	0.12370	67.850	8.0838	48.647	42.620	91.267	0.092059	0.16007
168	306.15	291.45	0.014782	0.12202	67.649	8.1950	48.939	42.360	91.299	0.092511	0.16000
169	309.56	294.86	0.014826	0.12037	67.447	8.3080	49.233	42.097	91.330	0.092964	0.15992
170	313.00	298.30	0.014871	0.11873	67.244	8.4228	49.529	41.830	91.359	0.093418	0.15985
171	316.47	301.77	0.014917	0.11710	67.038	8.5394	49.825	41.562	91.387	0.093874	0.15977
172	319.97	305.27	0.014963	0.11550	66.831	8.6579	50.123	41.290	91.413	0.094330	0.15969
173	323.50	308.80	0.015010	0.11392	66.622	8.7783	50.423	41.015	91.438	0.094789	0.15961
174	327.06	312.36	0.015058	0.11235	66.411	8.9007	50.724	40.736	91.460	0.095248	0.15953
175	330.64	315.94	0.015106	0.11080	66.198	9.0252	51.026	40.455	91.481	0.095709	0.15945
176	334.25	319.55	0.015155	0.10927	65.983	9.1518	51.330	40.171	91.501	0.096172	0.15936
177	337.90	323.20	0.015205	0.10775	65.766	9.2805	51.636	39.883	91.519	0.096636	0.15928
178	341.57	326.87	0.015256	0.10625	65.547	9.4114	51.943	39.592	91.535	0.097102	0.15919
179	345.27	330.57	0.015308	0.10477	65.326	9.5446	52.252	39.297	91.549	0.097569	0.15910
180	349.00	334.30	0.015360	0.10330	65.102	9.6802	52.562	38.999	91.561	0.098039	0.15900

SATURATION PROPERTIES OF FREON-12

Temperature, Deg. F.	Pressure, Lb. per Sq. In.		Volume, Cu. Ft. per Lb.		Density, Lb. per Cu. Ft.		Enthalpy, Btu per Lb.			Entropy, Btu per Lb. per Deg. Abs.	
	Abs.	Gage	Liq.	Vapor	Liq.	Vapor	Liq.	Latent	Vapor	Liq.	Vapor
180	349.00	334.30	0.015360	0.10330	65.102	9.6802	52.562	38.999	91.561	0.098039	0.15900
181	352.76	338.06	0.015414	0.10185	64.877	9.8182	52.874	38.697	91.571	0.098509	0.15891
182	356.55	341.85	0.015468	0.10041	64.649	9.9587	53.188	38.391	91.579	0.098982	0.15881
183	360.38	345.68	0.015524	0.098992	64.418	10.102	53.504	38.081	91.585	0.099457	0.15871
184	364.23	349.53	0.015580	0.097584	64.185	10.248	53.822	37.767	91.589	0.099933	0.15861
185	368.11	353.41	0.015637	0.096190	63.949	10.396	54.141	37.449	91.590	0.10041	0.15850
186	372.02	357.32	0.015696	0.094810	63.711	10.547	54.463	37.127	91.590	0.10089	0.15839
187	375.96	361.26	0.015756	0.093443	63.470	10.702	54.786	36.800	91.586	0.10138	0.15828
188	379.94	365.24	0.015816	0.092089	63.225	10.859	55.111	36.469	91.580	0.10186	0.15817
189	383.94	369.24	0.015878	0.090747	62.978	11.020	55.439	36.133	91.572	0.10235	0.15805
190	387.98	373.28	0.015942	0.089418	62.728	11.183	55.769	35.792	91.561	0.10284	0.15793
191	392.05	377.35	0.016006	0.088101	62.475	11.351	56.101	35.447	91.548	0.10333	0.15780
192	396.14	381.44	0.016073	0.086796	62.218	11.521	56.435	35.096	91.531	0.10382	0.15768
193	400.27	385.57	0.016140	0.085502	61.958	11.696	56.772	34.739	91.511	0.10432	0.15755
194	404.44	389.74	0.016209	0.084218	61.694	11.874	57.111	34.377	91.488	0.10482	0.15741
195	408.63	393.93	0.016280	0.082946	61.426	12.056	57.453	34.009	91.462	0.10532	0.15727
196	412.86	398.16	0.016352	0.081683	61.155	12.242	57.797	33.636	91.433	0.10583	0.15713
197	417.12	402.42	0.016426	0.080431	60.879	12.433	58.144	33.256	91.400	0.10634	0.15698
198	421.41	406.71	0.016502	0.079188	60.599	12.628	58.494	32.869	91.363	0.10685	0.15683
199	425.73	411.03	0.016580	0.077953	60.315	12.828	58.847	32.476	91.323	0.10737	0.15667
200	430.09	415.39	0.016659	0.076728	60.026	13.033	59.203	32.075	91.278	0.10789	0.15651
201	434.48	419.78	0.016741	0.075511	59.732	13.243	59.562	31.668	91.230	0.10841	0.15634
202	438.91	424.21	0.016826	0.074301	59.433	13.459	59.924	31.252	91.176	0.10894	0.15617
203	443.36	428.66	0.016912	0.073099	59.128	13.680	60.290	30.828	91.118	0.10947	0.15599
204	447.85	433.15	0.017002	0.071903	58.818	13.908	60.659	30.396	91.055	0.11001	0.15580
205	452.38	437.68	0.017094	0.070714	58.502	14.141	61.032	29.955	90.987	0.11055	0.15561
206	456.94	442.24	0.017188	0.069531	58.179	14.382	61.409	29.505	90.914	0.11109	0.15541
207	461.53	446.83	0.017286	0.068353	57.849	14.630	61.790	29.045	90.835	0.11164	0.15521
208	466.16	451.46	0.017387	0.067179	57.513	14.886	62.175	28.574	90.749	0.11220	0.15499
209	470.82	456.12	0.017492	0.066009	57.168	15.149	62.565	28.092	90.657	0.11276	0.15477
210	475.52	460.82	0.017601	0.064843	56.816	15.422	62.959	27.599	90.558	0.11332	0.15453
211	480.25	465.55	0.017713	0.063679	56.455	15.704	63.359	27.093	90.452	0.11390	0.15429
212	485.01	470.31	0.017830	0.062517	56.084	15.996	63.764	26.573	90.337	0.11448	0.15404
213	489.82	475.12	0.017952	0.061355	55.703	16.299	64.174	26.040	90.214	0.11506	0.15377
214	494.65	479.95	0.018079	0.060193	55.312	16.613	64.591	25.490	90.081	0.11566	0.15349
215	499.53	484.83	0.018212	0.059030	54.908	16.941	65.014	24.925	89.939	0.11626	0.15320
216	504.44	489.74	0.018351	0.057864	54.492	17.282	65.444	24.341	89.785	0.11687	0.15290
217	509.38	494.68	0.018497	0.056694	54.062	17.639	65.881	23.738	89.619	0.11749	0.15257
218	514.36	499.66	0.018651	0.055518	53.616	18.012	66.327	23.113	89.440	0.11813	0.15223
219	519.38	504.68	0.018814	0.054334	53.153	18.405	66.782	22.465	89.247	0.11877	0.15187
220	524.43	509.73	0.018986	0.053140	52.670	18.818	67.246	21.790	89.036	0.11943	0.15149
221	529.52	514.82	0.019169	0.051934	52.167	19.255	67.722	21.086	88.808	0.12010	0.15108
222	534.65	519.95	0.019365	0.050711	51.638	19.720	68.209	20.350	88.559	0.12079	0.15064
223	539.82	525.12	0.019576	0.049468	51.082	20.215	68.711	19.575	88.286	0.12150	0.15017
224	545.02	530.32	0.019804	0.048200	50.494	20.747	69.228	18.757	87.985	0.12223	0.14966
225	550.26	535.56	0.020053	0.046900	49.868	21.322	69.763	17.888	87.651	0.12298	0.14911
226	555.54	540.84	0.020327	0.045559	49.196	21.949	70.320	16.958	87.278	0.12377	0.14850
227	560.85	546.15	0.020632	0.044166	48.468	22.642	70.904	15.953	86.857	0.12459	0.14782
228	566.20	551.50	0.020978	0.042702	47.669	23.418	71.519	14.854	86.373	0.12545	0.14705
229	571.60	556.90	0.021378	0.041140	46.778	24.307	72.177	13.629	85.806	0.12638	0.14617
230	577.03	562.33	0.021854	0.039435	45.758	25.358	72.893	12.229	85.122	0.12739	0.14512
231	582.50	567.80	0.022450	0.037492	44.544	26.672	73.696	10.553	84.249	0.12852	0.14380
232	588.01	573.31	0.023262	0.035041	42.988	28.538	74.651	8.335	82.986	0.12987	0.14191
233.6 (Critical)	596.9	582.2	0.02870	0.02870	34.84	34.84	78.86	0	78.86	0.1359	0.1359

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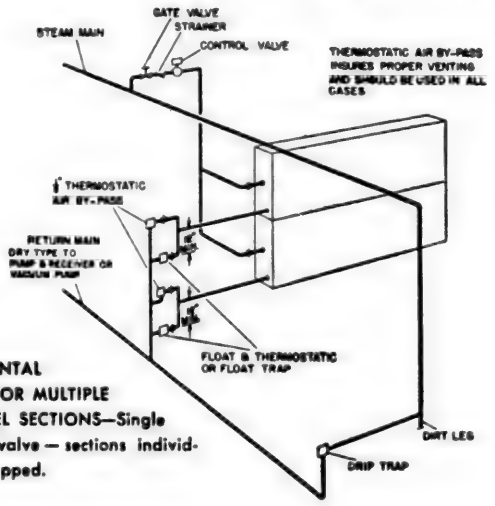
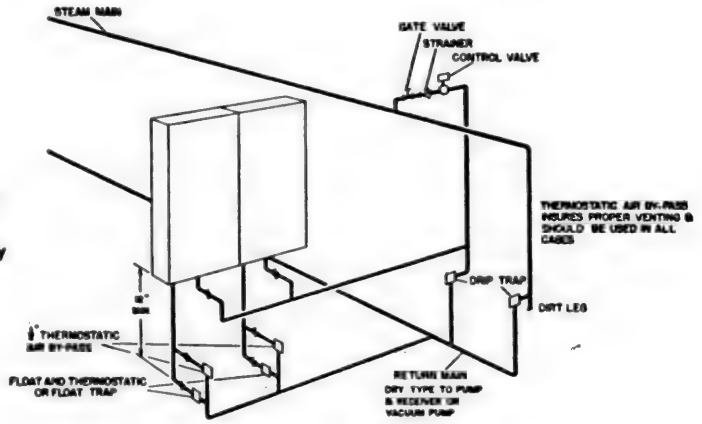
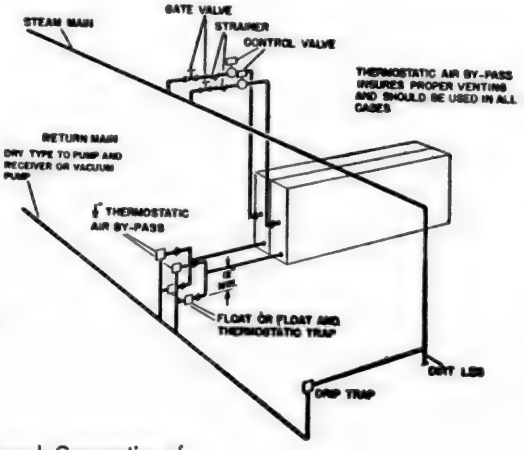
PIPING FOR HEATING COILS


STEAM MAIN
GATE VALVE
STRAINER
CONTROL VALVE
THERMOSTATIC AIR BY-PASS INSURES PROPER VENTING AND SHOULD BE USED IN ALL CASES
THERMOSTATIC AIR BY-PASS
RETURN MAIN DRY TYPE TO PUMP & RECEIVER OR VACUUM PUMP
FLOAT & THERMOSTATIC OR FLOAT TRAP
DIRT LEG
DRIP TRAP

HORIZONTAL SINGLE OR MULTIPLE PARALLEL SECTIONS—Single control valve — sections individually trapped.


STEAM MAIN
GATE VALVE
STRAINER
CONTROL VALVE
THERMOSTATIC AIR BY-PASS INSURES PROPER VENTING & SHOULD BE USED IN ALL CASES
DRIP TRAP
DIRT LEG
THERMOSTATIC AIR BY-PASS
FLOAT AND THERMOSTATIC OR FLOAT TRAP
RETURN MAIN DRY TYPE TO PUMP & RECEIVER OR VACUUM PUMP

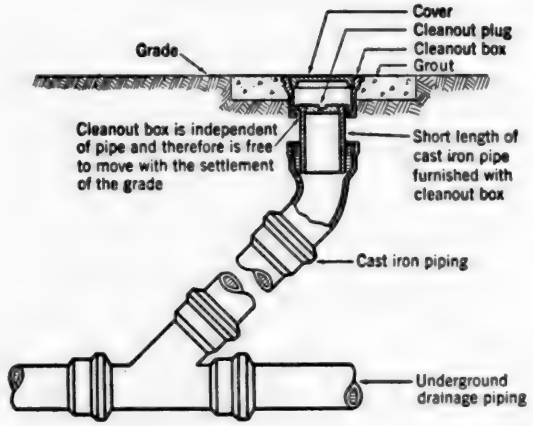
VERTICAL SINGLE OR MULTIPLE PARALLEL SECTIONS—Single control valve—sections individually trapped.


STEAM MAIN
GATE VALVE
STRAINER
CONTROL VALVE
THERMOSTATIC AIR BY-PASS INSURES PROPER VENTING AND SHOULD BE USED IN ALL CASES
RETURN MAIN DRY TYPE TO PUMP AND RECEIVER OR VACUUM PUMP
THERMOSTATIC AIR BY-PASS
FLOAT OR FLOAT AND THERMOSTATIC TRAP
DIRT LEG
DRIP TRAP

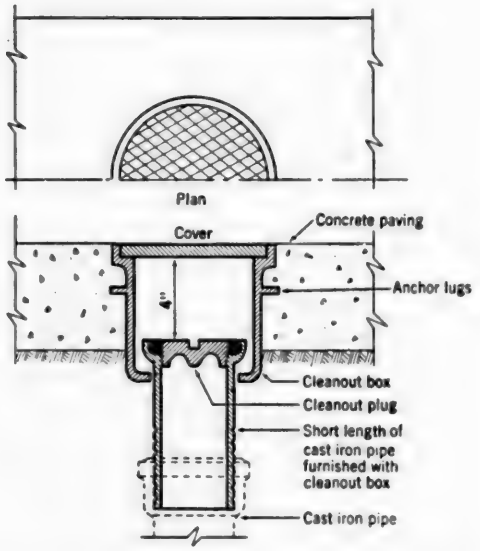
HORIZONTAL SECTIONS IN SERIES IN AIR STREAM — Individually controlled — individually trapped.

Drawings Presented Through Cooperation of
John J. Nesbitt, Inc., Philadelphia, Pa.

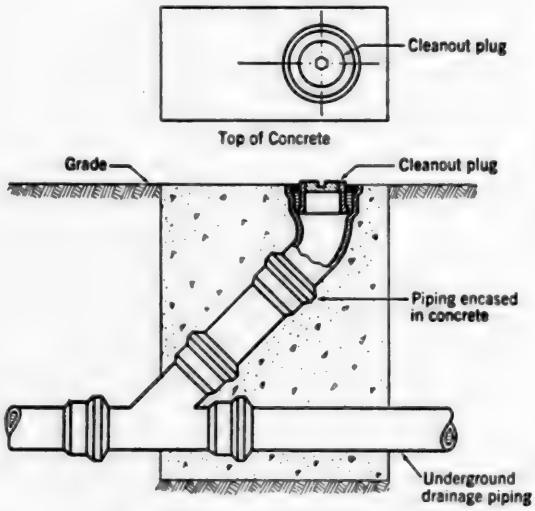
INSTALLATION OF CLEANOUTS


Cover
Cleanout plug
Cleanout box
Grout
Grade
Cleanout box is independent of pipe and therefore is free to move with the settlement of the grade
Short length of cast iron pipe furnished with cleanout box
Cast iron piping
Underground drainage piping

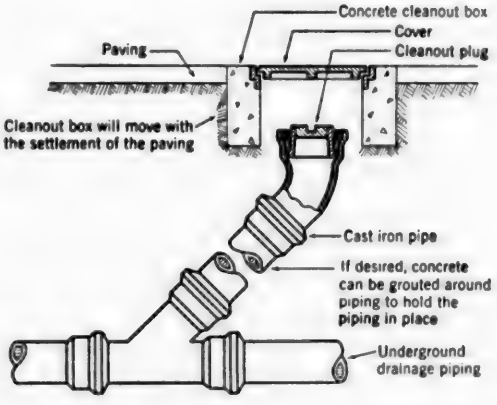
Typical arrangement of cleanout and piping for areas not subject to heavy foot traffic



Typical arrangement of cleanout and piping for areas surfaced with concrete



Arrangement of cleanout and piping for areas subject to constant foot traffic and occasional heavy loads


Concrete cleanout box
Cover
Cleanout plug
Paving
Cleanout box will move with the settlement of the paving
Cast iron pipe
If desired, concrete can be grouted around piping to hold the piping in place
Underground drainage piping

Cleanout and piping installed under areas that are paved

Drawings Presented Through Cooperation of
Louis Blendermann, Glen Cove, N. Y.

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

BUILT-IN STRAINER TRAPS. Production manager of a Mass. jewelry manufacturer testifies that installation of 600 of this company's built-in strainer steam traps over the past ten years resulted in savings of $80,000 by reducing annual fuel costs $8,000, sharp steam pressure reduction, and freedom from trap servicing except cleaning. Available is 44-page book.
Inside Front Cover — Item 117

INDUCED DRAFT CATALOG. A new induced draft fan catalog with boiler ratings expressed in Btu per hr is offered by this manufacturer as a working tool for both the engineer and contractor. Included are tables and charts on volume of flue gas for oil, gas, and coal. Copies are available.
Page 1 — Item 118

HEATING SPECIALTIES. Hot water heating specialties, boiler water level controls for low pressure steam heating boilers, and other protective and control devices are offered by this manufacturer, who claims the largest and most complete line of its kind in the world.
Page 4 — Item 119

PACKAGED AIR CONDITIONERS. Packaged air conditioners are available from this company in 3, 5, 7½, and 10-hp sizes. Open-type condensing units are also available in a wide range of sizes from ¼ to 100 hp. Information is available.
Page 9 — Item 120

CENTRIFUGAL FANS. Made in two types, standard and heavy duty. Housing dimensions the same but have different performance characteristics. Forward curve wheels from 7½ to 73 inches. Quiet operating, medium speed wheels with wheel diameters from 15 to 73 inches. Line features all welded housing. Bulletins available.
Page 14 — Item 121

WROUGHT IRON PIPE. Dependable snow melting was the leading design objective for access ramp of the new Connecticut General Life Insurance Co. office building. Four major factors supported the use of wrought iron for this job: its corrosion-resistance, rugged strength, low coefficient of expansion with concrete, and ease of fabrication. Booklet for wrought iron for snow melting systems available.
Page 15 — Item 122

REFRIGERANT LINE. In the interest of helping to standardize refrigerant terminology and nomenclature the company is adopting the recommendations of trade and technical associations throughout the industry by applying a standard numerical code system to its line of refrigerants.
Page 17 — Item 123

UNIVERSAL PUMPS. Designed specifically for quiet operation in liquid heating and cooling systems, these pumps have non-overloading motor with oil-lubricated sleeve bearings, ring-type mounted and completely suspended in rubber. Spring-type coupler protects against strain of starting torque. Also featured are oversized shaft, sleeve bearings, removable bearing frame, mechanical seal which positively prevents water leakage up to full design pressure, hydraulically balanced impeller, and solid type volute.
Pages 18-19 — Item 124

FANS AND BLOWERS. During the postwar building program for New York and urban areas, nine heating and ventilating contractors installed this company's fans and blowers in 91 schools. Information is available.
Pages 20-21 — Item 125

COOLING SERVICE. Engineering service offered by this manufacturer of air conditioning and refrigeration equipment includes surveys, sales-engineering, design, manufacture, shipment, installation and maintenance. Literature and estimates are available.
Page 22 — Item 126

BALL BEARINGS. Manufacturer's ball bearings are designed expressly for residential heating and air conditioning equipment. The bearings feature balls and races especially finished for quiet performance.
Page 23 — Item 127

COAL-FIRED BOILERS. Two of this company's coal-fired boilers help cut fuel and other plant costs at a North Carolina resort. The boilers replaced five older units to supply steam for all purposes to ten buildings. Information is available.
Page 24 — Item 128

AIR CONDITIONING CONTROLS. Church of Christ the King, Chicago, has year-round air conditioning controlled by this company's system. Result is draftless, dustless, comfortable interior in all seasons. Over 60 years of experience is at your disposal in selecting the most efficient control system for your building.
Page 25 — Item 129

COPPER TUBE. Manufacturer features the personal service that accompanies every order for copper tubing to eliminate delays and speed deliveries from mill to distributor to contractor. This service is in addition to a reputation for uniform quality second to none in the industry.
Page 29 — Item 130

STEAM HUMIDIFIERS. This company will help you humidify an office, a cement plant, or a church at less cost by steam humidification. Steam is discharged directly into room, duct, or plenum chamber. For explosive atmospheres, there are air-operated models. Relative humidity held within 2 to 4% of setting. Practically no maintenance. Bulletin available.
Page 30 — Item 131

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66
67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110
111 112 113 114 115 116
117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138
139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160
161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182
183 184 185 186 187 188 189 190 191 192 193

PLEASE PRINT Dec. H-56

This service available only to U.S. and Canadian readers.

Name .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

This card is void after Mar. 1, 1957

Ad-Digest

REFRIGERATION TUBING. Copper tubing is made for air conditioning and refrigeration equipment by this fabricator with inside and outside diameters to tolerances within thousandths of an inch. Type L copper tube, soft copper refrigeration tube, and wrought copper solder joint fittings are available.
Page 32 Item 132

RENEWABLE DISC GLOBE VALVE. A bronze globe valve with a renewable composition disc is made by this company for 150 lb steam and 300 lb oil, water, or gas in sizes from ⅛ to 3 in. With interchangeable parts, the line of valves provides globe, angle, and check patterns to meet 90% of average valve needs. Information is available.
Page 33 Item 133

STEEL PIPE. Control of chemical composition in this company's pipe is the first requirement assuring maximum weldability. Clean beveled ends, uniform wall thickness and diameter means the ends line up well. Information is available.
Page 34 Item 134

DAMPERING DEVICES. Proper methods of dampering are discussed. Topics covered are: dampers for grilles, dampers for ceiling diffusers, and general application data. Company invites you to take specific problems involving air distribution to its engineering department. System balancing is made easier with this company's dampers for use with grille, dampers for use with ceiling diffusers. Catalogs available.
Pages 35 to 37 Item 135

SOUND CONTROL. A 5-ft sound trap replaces 80 ft of ordinary duct lining for controlling air conditioning noise. The units suppress sound in low velocity air conditioning systems and will silence an entire system or selected outlets. Information is available.
Pages 38-39 Item 136

FOIL-FACED INSULATION. Manufacturer's foil-faced insulation was applied to prevent condensation on sheet metal air conditioning ducts in University Bowling Alleys of Toledo, Ohio. Advantages included ease of handling, ease of cutting and fabrication, resistance to tearing and economy of storing.
Page 40 Item 137

REFRIGERANT EQUIPMENT. A new plant on a 75-acre tract in Sidney, Ohio, opens a new era for the company, its dealers and wholesalers. Enlarged and modernized facilities will provide more efficient service for their customers.
Page 41 Item 138

NEW IDEAS IN DEVELOPMENT. Under the auspices of the American Society of Heating and Air Conditioning Engineers and in conjunction with their 63rd Annual Meeting, the 13th International Heating and Air Coditioning Exposition will be held in the International Amphitheatre, Chicago, Ill. from Feb. 25 to March 1, 1957.
Page 42 Item 139

DRAFTLESS AIR DIFFUSERS. The all-air high velocity units with new simple automatic controls deliver constant volume regardless of fluctuation of inlet pressures of either the hot or cold valve. Capacities of constant volume units can be pre-set at the factory.
Page 43 Item 140

ELECTRONIC TEMPERATURE CONTROLS. Operation of small-system air conditioning is fully automatic and has big-system flexibility, convenience, and operating efficiency. Restaurant illustrated has automatic change-over from heating to ventilation to cooling, without attention, and automatic use of outdoor air for cooling whenever conditions permit. Booklet available.
Pages 44-45 Item 141

CENTRAL AIR CONDITIONER. The manufacturer's central air conditioning system consisting of packaged liquid chiller and condensing unit for a Florida motel has proved so effective that a second central system is being ordered for a new construction. Bulletin is available.
Page 46 Item 142

PACKAGED BOILERS. Packaged boilers are offered by this manufacturer in 18 sizes. 110 models, with capacities from 15 to 600 hp. Where conditions dictate, oil, gas, or combination oil-gas firing can be selected. Once installation is completed, arrangements are made for training the purchaser's operator.
Page 47 Item 143

CEILING DIFFUSER. A uniform, draft-free air distribution pattern as shown is typical of the result predictable with the company's ceiling diffusers. Performance of diffusers is guaranteed when they are used according to published data.
Page 48 Item 144

PUMP LINE. A line of pumps is manufactured by this company which covers any type of heating requirement. A bulletin on each type of pump in the line is available.
Page 49 Item 145

COOLING TOWERS. Vinsynite, vinyl zinc, and chlorinated rubber paint are three protections that are used on this manufacturer's cooling towers. This combination offers protection against corrosion. Details on the line of towers is available.
Page 50 Item 146

PACKAGED STEAM GENERATORS. Completely packaged steam generators are guaranteed to develop maximum rated capacities at thermal efficiencies in excess of 80%. Their design embodies features which insure long life, dependability and maximum fuel economy.
Page 51 Item 147

MOTOR CONTROL. The company's motor starters have the simplest contact mechanism yet devised for air conditioning or for refrigeration installations. There is only one moving part, the solenoid plunger which carries the double break contacts. Costly and troublesome maintenance is eliminated.
Page 52 Item 148

REFRIGERANT CONTROLS. A complete line of refrigerant controls is offered by this company. Line includes thermostatic expansion valves, solenoid valves, suction lined regulators, flooded evaporator controls and reversing valves.
Page 53 Item 149

PACKAGED BOILERS. The busy engineer welcomes the fact that there is one source of responsibility for every part of a packaged boiler. Fire-tested before shipment, this company's units are guaranteed 85% efficient. From 20 to 500 hp, it has two-pass design, special technique for air-fuel mixing, high CO_2 and low-temperature stack gases, free and rapid water circulation, and easy access.
Page 54 Item 150

HEAVY-DUTY FAN. Mechanical efficiency of 86% in actual performance is promised for these fans on class II to IV service. Fan curves are presented. Recommended for high pressure conduit air conditioning, mechanical draft, and industrial jobs. Complete inlet-to-outlet streamlining. Bulletin is available.
Page 55 Item 151

PRE-FABRICATED PIPING SYSTEMS. Over 75 national and international field offices are available on any project dealing with prefabricated piping systems. A company representative will be glad to discuss plan involving steam, hot water or oil distribution line.
Page 56 Item 152

AIR HANDLING UNITS. Both product temperature control and comfort cooling and heating requirements are handled at modern winery at Modesto, Calif. by this company's vertical air handling units. Other units available in vertical floor mounted or horizontal ceiling hung models in capacities from 2.5 to 90 tons with a wide selection of accessory equipment. Models incorporate patented inner fin coil construction. Catalog available.
Page 57 Item 153

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

Ad-Digest

BLOWERS. This company's engineers design fans and blowers to suit the conditions of a specific exhaust or ventilation problem. Guaranteed to meet NAFM and PFMA codes. Illustrated are a backward curve blower installed in the roof of huge auto body plant, and a group of 39 centrifugal exhausters on apartment building. Bulletins available.
Page 58 Item 154

STEAM TRAPS. Quick delivery and proven durability are reasons why the manufacturer's steam traps comprise 95% of the steam traps in the Elkhart, Indiana, school system. Bulletin available.
Page 59 Item 155

AIR CONDITIONING EQUIPMENT. The latest addition to the Giant chain of supermarkets in Washington, D. C., is air conditioned with the company's equipment. Products specified for this installation included a ceiling-type air conditioning unit, ceiling type heating and ventilating unit and two 25-ton towers.
Page 60 Item 156

GALVANIZED SHEETS. Anything that can be made of steel sheets can be made of the galvanized sheets manufactured by this company because the zinc coating will not chip or crack. Tight crimps and locked seams can be made with the sheets without breaking the coating. Samples and information are available.
Page 61 Item 157

DRAIN PIPE. Acid-proof drain pipe is manufactured by this company of high silicon iron drain line material for corrosion resistance when handling all acids and other corrosives. A complete stock of pipe and fittings is offered. Information is available.
Page 62 Item 158

AIR CONDITIONING PRODUCT. Ad relates the acquisition by National-U. S. Radiator Corp. of the air conditioning division of Union Asbestos & Rubber Co. A continuation of the same high quality air conditioning equipment previously available is assured.
Page 63 Item 159

AIR CONDITIONING UNITS. Air conditioning units with a muggy-air control are made by this company to take the chill and dampness out of cooling on muggy days without reheat or dampers. With two independent refrigerant circuits the upper circuit can be cut out to increase the dehumidifying effect by lowering the refrigerant temperature. Bulletin available.
Page 64 Item 160

WARM AIR HEATERS. Over a period of three years an Illinois manufacturing company installed 24 counterflow heaters manufactured by this advertiser. The result was a cut in operating cost to less than half of former steam system. Service costs were 50% less than anticipated. Prompt information is available on heating of plant, warehouse or building.
Page 65 Item 161

COPPER WATER TUBE. Long lengths of tube, and solder fittings requiring no wrench room or thread cutting are attributes that make copper tube suitable for radiant panel heating, hot and cold water lines, processing lines, underground service lines, drain, waste and vent lines. Information is available.
Page 121 Item 162

AIR FILTERS. Advertisement features random thoughts from a filter engineer which include automation as applied to air filters and over-all costs of air filters.
Page 123 Item 163

UNDERGROUND PIPE INSULATION. Two mid-western schools installed the company's triple zone insulation system for protection of underground steam and condensate return lines. The easily installed insulation helped keep installation cost down in both instances.
Page 129 Item 164

UNIT HEATERS. Built for steam and hot water service, unit heaters are available in horizontal and vertical delivery types. Company's velocity generator feature produces penetrating heat throw which cuts through cold air strata near floor improving over-all heating efficiency.
Page 131 Item 165

FORCED DRAFT BURNERS. Each firing unit made by this manufacturer is a complete combustion system consisting of burner, forced draft air supply, fuel system, and control panel. The burner is available for oil, gas, or in a dual fuel combination. Technical information and specifications available.
Page 133 Item 166

STRIP AIR DIFFUSERS. Installed as a continuous strip in window head or sill (as illustrated), this device is the most practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill. It can be blended as a continuous decorative unit or used in sections, can be hidden in shallow lighting coves, and combined with unit or continuous lighting fixtures.
Page 137 Item 167

AIR FILTERS. The glass fiber air filters manufactured by this company have a lighter-to-heavier density of filter media from front to back. The filters are being planned for a new surgical dressings research and manufacturing plant. Information is available.
Page 139 Item 168

PORTABLE CONTACT PYROMETER. Surface temperatures read accurately, instantly, with this handy, portable contact pyrometer, a well-balanced instrument mounted in sturdy case for protection. Has jeweled movement, is shock resistant. Eight standard F scale ranges available up to 1200 deg. Bulletin is available.
Page 141 Item 169

ROOF VENTILATORS. The line of roof ventilators made by this company includes a low contour model, a large volume model for high velocities, wind driven turbine types, and exhaust fans for corrosive fumes. Catalog with specifications and performance data is available.
Page 141 Item 170

ELECTRIC HEATING. New application information on the uses of electric heating equipment for winter weather problems is given in a book offered by this manufacturer. Factual reports give solutions to problems on room heating, snow melting, de-icing, or warming materials.
Page 142 Item 171

REFRIGERANT INDICATORS. Refrigerant indicators are made by this company in six sizes from ⅜ to 1 ⅜ in. ODS. They have a preformed copper extension that eliminates the need for separate gaskets. Catalog is available.
Page 142 Item 172

STEAM HEATING SPECIALTIES. A complete quality line of traps, valves, pumps or other steam specialties is available from this company. Whether for one-pipe or two-pipe steam, hot water, residential, or industrial systems, each item in this complete quality tested line is backed by dependable single source supply and responsibility.
Pages 142-143 Item 173

AIR METER. Air conditioning, heating, and ventilating systems are accurately balanced with this company's air meter. Air velocity, temperature, and static pressure indicated in response to color-coded pushbuttons. Bulletin available.
Page 143 Item 174

HEATERS. Direct-fired warm air heaters are made by this company in a full range of sizes for gas, oil, or gas-oil firing. A gas-fired, infra radiant heater is also made by the company for commercial and industrial heating. Bulletins are available.
Page 143 Item 175

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
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Ad-Digest

PRESSURE CONTROLS. These dual-purpose pressure controls incorporate a single pressure element which operates two separate, independently adjustable switches which may be used for multiple circuit control. Examples are given. Available in 17 pressure ranges from 30 in. vacuum to 2500 psi.
Page 144 Item 176

ADJUSTABLE AIR DIFFUSERS. Both round and square adjustable air diffusers are offered by this company in addition to a new slot type. The diffusers blend unobstrusively with the architectural scheme of things. Specifications, engineering and installation information are available.
Page 145 Item 177

OIL-GAS BURNERS. Dual fuel burners are manufactured by this company in sizes from 1 to 40 gph and in capacities from 100,000 to 5,400,000 Btu per hr. Automatic change-over can be accomplished by outdoor thermostat or any other suitable sensing switch. Descriptive circulars describing features and giving specifications are available.
Page 146 Item 178

VANEAXIAL-TYPE FANS. Aerodynamic blades with close tip tolerance plus internal vanes which convert rotative air energy to velocity and pressure, save power. Designed for installation in the duct, saving space and installation expense. Bulletin is available.
Page 147 Item 179

PACKAGE CHILLERS. Illustrated is package chiller installed at National Zoological Park, Washington, D. C., where chilled water maintains penguin pool at 35 deg F and cage at 40 deg, and is used also to hose down cage floor, yet with room left for 400 gal storage tank. Patented inner-fin design is the reason. All copper construction; 2 to 100 hp models.
Page 148 Item 180

PACKAGED BOILERS. Maintenance superintendent of Chattanooga, Tenn., feed mill attests to reliability, economy, and ease of operation of this company's 40,000 lb per hr packaged steam generator installed 18 months ago. Also produced are flash drying systems, pressure vessels, home heating and cooling units, domestic water heaters, and soil pipe.
Page 149 Item 181

AIR FILTERS. The line of air filters offered by this manufacturer includes: a viscous type, permanent and cleanable, in 1- and 2-in. thicknesses for low velocity systems; one that operates at 300 to 500 fpm in 2- and 4-in. thicknesses; and a permanent, cleanable grease filter in 2-in. thickness for range canopies and kitchens. Bulletins are available.
Page 151 Item 182

FLOATS. This company is prepared to solve liquid level control problems involving floats and provides complete technical data on types, sizes and suitable metals for floats, depending on conditions. Made in a variety of metals in sizes from 2½ to 14 inches. Catalog available.
Page 151 Item 183

SPRAYING SYSTEMS. The manufacturer describes the industrial spray nozzle catalog which gives data on thousands of standard and special spray nozzles for every type of spraying. The reference manual has information for improving spraying operations and lowering spraying costs.
Page 151 Item 184

VIBRATION CONTROL. Vibration and noise control units made by this company permit the installation of heavy boilers, compressors, and fans on roofs without transmitted vibration to floors below. A booklet on upper floor installations and a bulletin on vibration control specifications for air conditioning are available.
Page 152 Item 185

SECTIONAL DUCT FURNACE. Sectional duct furnaces provide flexibility by eliminating restrictions of packaged heating equipment which isn't exactly right for any one job because it has to be almost right for so many jobs. System capacities of 2 million Btu per hr are available from furnaces whose duct sections weigh no more than 315 lb.
Page 153 Item 186

HEAVY DUTY STEAM COILS. Every square foot of face area of these heavy duty distributor type coils produces equal heating capacity on full or modulated steam supply. Tilted feature assures condensate drainage. Coil capacity is increased and hot end stress eliminated due to perforated cover pieces at header and stub ends permitting measured amount of by-pass air. One or 2 rows.
Page 155 Item 187

CENTRIFUGAL VENTILATOR. An aluminum, belt-drive centrifugal ventilator is manufactured by this company in sizes from 1000 to 16,500 cfm. Direct drive models are also available in 7- to 30-in. sizes. Catalog is available.
Page 155 Item 188

FLEXIBLE EXHAUST HOSE. This easy-to-install flexible, long lasting hose will give you exhaust when you want and where you want it for every industrial application. Flexible hose can be used for fume exhaust, dust or chip collection, ventilation and handling of bulky materials. Bulletin gives complete data on flow characteristics, installation procedure, sizes, fittings, and accessories.
Page 155 Item 189

CONDENSERS. For large refrigeration systems, this manufacturer offers a choice between a battery of condensers or a high capacity condenser that saves space. Both remove superheat and keep the system free of oil. A wet bulb control automatically gives low head pressure operation. Bulletin is available.
Page 156 Item 190

AIR CONDITIONING EQUIPMENT. Eighteen pamphlets containing helpful air conditioning and refrigeration data are available from this manufacturer of heating, ventilating and air conditioning units. Items include its cooling tower, a discussion of steam, water and direct expansion, air handling, the air cooled condenser, central plant air conditioner, and ceiling-hung conditioners.
Page 158 Item 191

AIR VELOCITY METER. An air meter is made by this manufacturer for checking velocities from 400 to 10,000 fpm and static pressures from 0 to 10 in. of water. The meter kit includes a manometer, 18-in. stainless steel pilot tube, magnetic holding clips, and necessary fittings and tubings. Literature and prices are available.
Page 160 Item 192

AIR CONDITIONING CONTROL. The company's system of pneumatic control was used in the new Statler-Hilton Hotel of Dallas, Texas, to regulate the 1400-ton refrigeration system, a high pressure conduit system for guest room air conditioning, and 20 central fan systems supplying conditioned air to the public areas.
Back Cover Item 193

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AD-DIGEST SERVICE

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Gas Service for Multi-Story Buildings

MANY of the multi-story buildings now being erected, including apartment houses and low rent housing projects, will be equipped with a complete system of gas piping to serve each apartment. Gas will be supplied to gas ranges and possibly to gas refrigerators.

The decision to use gas or electrical ranges and refrigerators is based on factors of economy. In certain areas of the country, gas rates are lower than the comparative electric rates. If, in a particular area, the gas rate is lower than that for electric service, the owner and engineer may decide to equip the building with gas and pass the savings on to the tenants. This is an especially important factor in low rent housing projects.

In this article it is assumed that gas has been selected for an apartment house and, therefore procedures to follow are described to provide a system that will offer many years of safe and active service.

Gas Distribution System

Let us assume that the building consists of 10 stories and will house 100 families. A required gas distribution system would be similar to that shown in Fig. 1 where it is shown that the gas service enters the building and passes through valves and a gas meter, and is then distributed throughout the building. Gas meters can be arranged in one of several ways, depending upon the requirements of the owner and the local gas company. Individual meters may be grouped together in a meter room, located in the basement of the building; or an individual meter might be located in each apartment. In Fig. 1, we have shown a single meter to serve all the tenants as is often accomplished in buildings of this sort. The cost of gas consumption is then averaged and included in the tenant's rent.

Installation of the gas service from the street main to the gas meter is not covered because the local gas company in the area may have a specific manner in which this piping is to be installed. In many places the local gas company will install the gas service up to and including the gas meter. The gas meter should be located in a well ventilated area in the basement or cellar of the building.

Vertical Piping

Figure 2 shows the vertical arrangement of the gas piping in the building. The piping system shown is known as an upfeed system. When properly sized, it can be counted upon to furnish the quantity of gas needed by the tenants during peak periods of use.

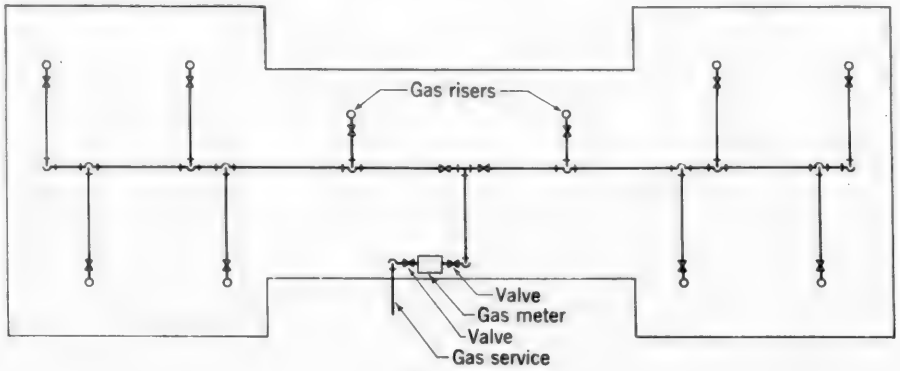
With regard to Fig. 2, it is important to note that drip pockets are placed at the base of all risers and at all low points in the gas distribution system. These drip pockets are described in more detail, later in the article.

Support of Gas Main

Since the gas piping is an upfeed system, the gas main will be located at the ceiling in the basement. Very often, the gas main will be placed on the same rack on which, cold, hot water and other services are supported. Figure 3 represents a typical arrangement of the gas piping in its position on the rack.

The rack shown is a trapeze hanger and offers a very favorable means of supporting several systems of piping.

In order to supply the risers, a branch is taken from the gas main as shown. The branch is equipped with a gate valve which is placed in an upright position on the branch. The valve may also be set at an angle as illustrated, but should not be placed with the valve handle extending downward for it will then have the disadvantage of collecting condensate. The gate valve will control the entire riser.



CELLAR PLAN

Fig. 1. Cellar plan showing typical arrangement of gas distribution piping in cellar of apartment house building.

Expansion

Expansion is not generally a factor that has to be considered when the gas main is in the basement, since there is no appreciable temperature differential in the line after the building is once in operation. However, if the piping run is rather long without offsets, then the engineer may find it necessary to utilize an expansion loop or other expansion devices approved by the local gas company.

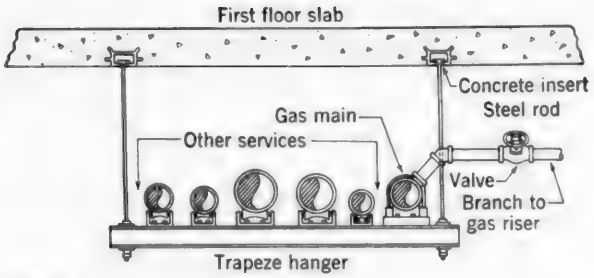
Drip Pockets

Drip pockets should be placed at the base of the gas risers as suggested by Fig. 4.

Referring to this illustration, one notices that the drip pocket used, consists of a gas cock, or lubricated plug cock as it is generally known, and a capped nipple. The gas cock is left in a closed position. Condensation in the line will drop to the base of the riser. To remove the accumulated condensation during periodic maintenance, it is only required to open the gas cock to allow the accumulation to drop into the capped nipple. The gas cock is then closed and the capped nipple removed. After the water flows out, the capped nipple is replaced. By installing the gas cock and following this procedure for removing condensation, there is no danger of escaping gas as is normally encountered when a gas cock is omitted.

The gas riser should be properly supported to avoid the strain that the weight of the piping can exert on the lower fittings. Pipe clamps or other devices can be used for this purpose and should be placed at every second or third floor as required.

For a gas riser, the piping should be installed with as few fittings as possible. Figure 4 shows that fittings are used only where the take-offs occur for each floor. Couplings should never be included especially with concealed piping. Pipe threads for gas piping must be of the proper length and cut with good dies. Pipe joint compound is applied to the male threads only. When care is exercised for the installation of gas piping, the danger of leakage is greatly reduced.



NOTE
Other types of supports for piping may also be used.

Fig. 3. Arrangement and support of gas main in the cellar.

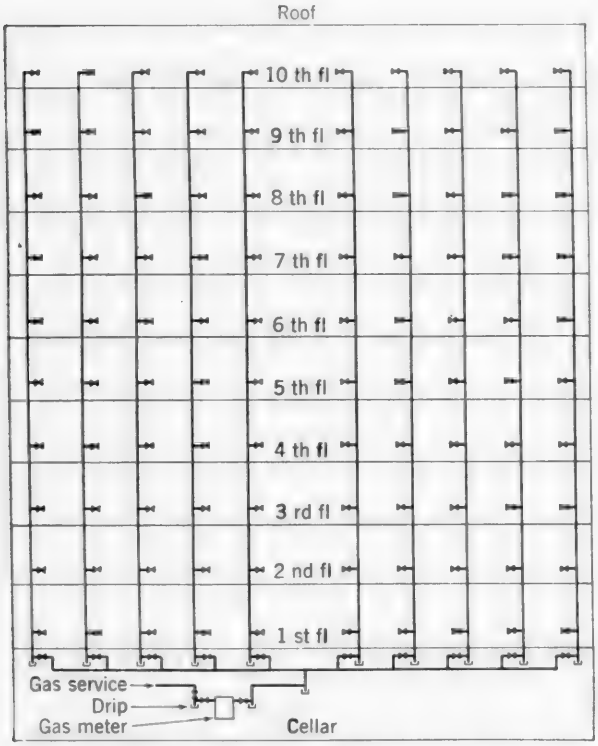


Fig. 2. Typical arrangement of gas risers in building.

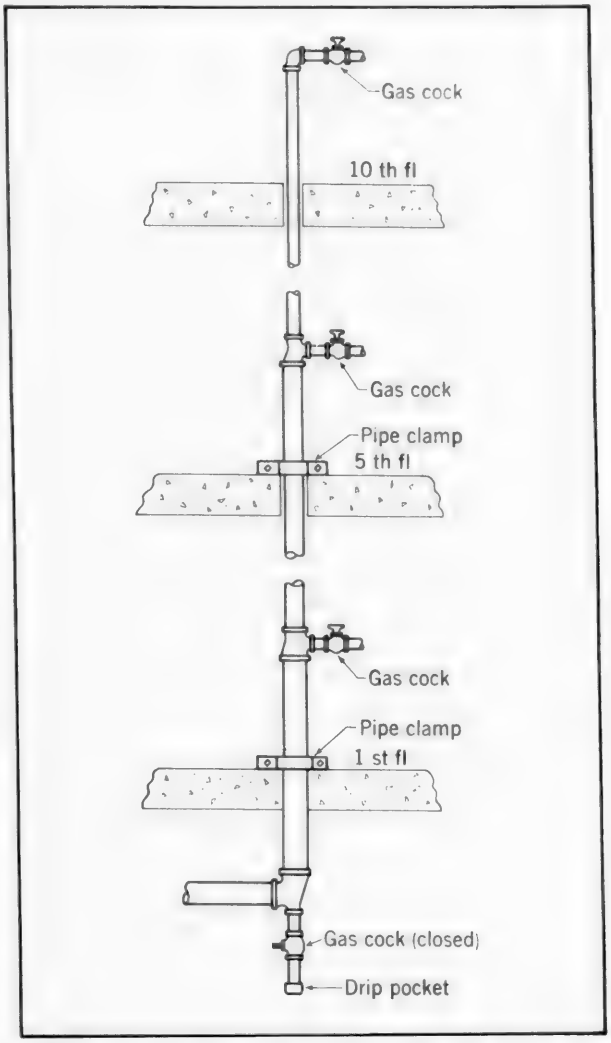


Fig. 4. Variations of piping connections for a gas riser.

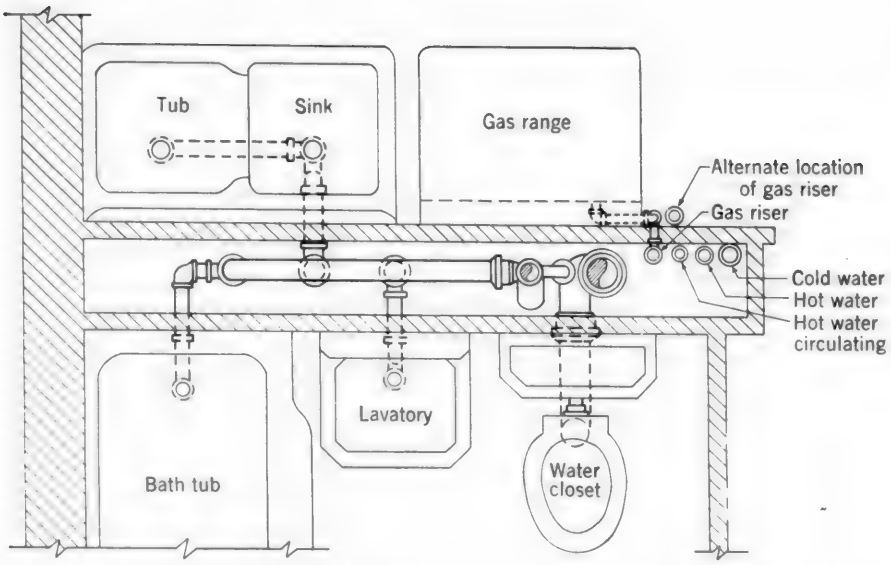


Fig. 5. Arrangement of gas piping to serve gas range.

Arrangement of Gas Riser in Pipe Chase

For an apartment house, the gas riser is generally installed in a pipe chase along with the water lines and the sanitary piping. Figure 5 is typical of the manner in which the riser might be arranged for many apartment houses and low rent housing projects. This is considered an economical arrangement for fixtures as well as the water, gas and waste facilities. Piping other than gas piping has been shown only to offer visual evidence of the way the space is filled with the necessary pipe roughing.

Note the alternate location of the gas riser in an exposed location in the kitchen. A good deal of attention should be given to installing the gas riser in an exposed position. When the piping is installed in exposed areas, any leakage is easily detected. However, when the gas riser is installed in the pipe shaft, leakage is often not discovered until it is too late.

Many pipe chases include large openings in each floor to allow for the passage of the various piping systems. Sometimes the openings consist of slots just large enough for the passage of each group of risers.

Any leakage in the pipe chase could be dangerous, particularly so if there are any obstructions which would tend to pocket the gas. In the few areas where a heavy gas is used, the gas will settle and accumulate in the lower portion of the shaft where it will remain until detected or ignited by an accidental spark. This is a potential hazard that must be avoided.

There are several methods that can be used to avoid this condition, when the gas piping is concealed. One method is to provide large openings in the pipe chase for the passage of the piping and, by means of a roof exhauster placed on top of the chase at roof level, generate a circulation of air in the shaft. This will prevent any dangerous gas accumulation. Lighter gases will accumulate in the upper portion of the shaft where it is equally dangerous.

Another way is to install the gas line in an exposed position in the kitchen where detection of gas leakage is quick. This is probably the safest method for installing gas risers in apartment house buildings despite the fact that the piping will appear as exposed lines in the kitchen.

Connections to Equipment

The final connection to the gas range is most generally accomplished in a manner similar to that shown in Fig. 6. The connection illustrated, is typical for either a concealed or exposed gas riser. It consists of a gas cock, right and left nipple and coupling and the regular pipe and fittings. Very often, copper tubing with flared ends is used to make the final connection.

Safety Precautions

There are a number of safety precautions to be ob-

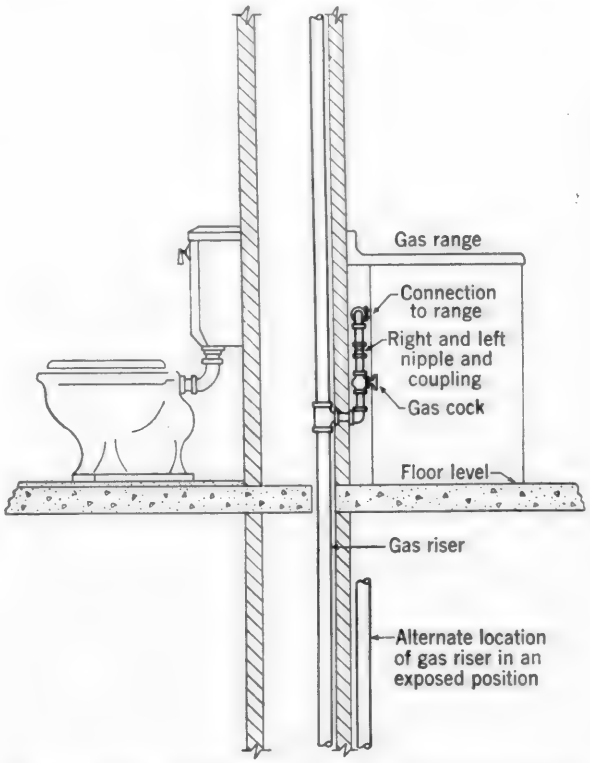


Fig. 6. Sections showing gas riser and piping connections to range.

served in design and included in the specifications for the gas piping system.

1. Pipe threads should be cut with good clean dies to ensure the proper engagement of the thread with the fitting.
2. Pipe compound should be applied to the male threads only to avoid excess amounts of the compound from entering the piping system where is can eventually find its way into small diameter openings or equipment itself.
3. Gas lines must be adequately supported at prescribed intervals for the diameter and pipe material used. This prevents the sagging of the lines which eventually cause leakage.
4. Drip pockets should be placed at all low points of the entire gas system to intercept the water condensation that forms in the line. Without drip pockets, water condensation would accumulate to the extent where it could reduce the volume of gas passing through the line or it could be blown into one of ranges where is can extinguish the flame and cause escape of deadly and explosive gas in the room.
5. Gas piping after it is installed should be tested in a manner prescribed by the local gas company having jurisdiction. This testing should be conducted in a thorough manner.
6. It is advisable to define in your specifications that the gas piping should not be used for other than gas supply. Very often, during the construction stages, some contractor will use the gas line as a temporary water supply to serve the construction needs of each floor. This procedure is detrimental to the gas line because it causes premature corrosion of the interior lining of the pipe. The result is a weakened pipe structure and an added factor of friction that will greatly reduce the flow of gas through the piping.

Gas is a clean and economical fuel to use. The piping system that conducts the gas to the fixtures may be regarded as non-hazardous if the few simple precautions outlined above are given some consideration in the design and specification as well as the installation stages for the project.

The American Gas Association, 420 Lexington Ave., New York, N. Y. has issued a very excellent booklet on recommended good practice concerning gas piping systems. This booklet is titled, Installation of Gas Piping and Gas Appliances in Buildings, ASA standard Z21, 30-1954.

Aluminum Pipe Gains in Irrigation Applications

According to G. J. McManus, writing in a recent issue of *The Iron Age*, aluminum irrigation pipe has made tremendous strides. Shipments in 1955 were 60 times greater than those in 1946. Aluminum pipe is very light and can be quickly and easily assembled, disassembled, and moved with a minimum of manpower. Controlled flow in aluminum pipe also gives efficient water use.

According to the author, aluminum pipe is used mainly in surface irrigation systems for reasons of cost and corrosion. Permanent underground systems still provide a steady market for cast iron, steel, concrete and other materials. Plastic pipe is also attracting new interest after getting off to a bad start. However, the big boom is in aluminum pipe. Both extruded and welded pipe are offered, and some is clad inside and out with a corrosion resistant alloy.

In operation, large feeder lines are strung along the ground from the water source to the field, and smaller lateral pipes run off in different patterns. The laterals may be either perforated to provide a continuous spray, or equipped with rotating nozzles. Another method makes use of slotted pipes that run along the head of a field and allow water to seep down furrows.

The biggest market for irrigation pipe is currently in the Western and Southwestern states. At the last count some 28 million acres were being irrigated in that region.

In recent years, the humid areas of the Southeastern states have also taken to crop irrigation, the reason being that most crops need more regular watering than rainfall provides. States east of the Mississippi have more than tripled their irrigation since 1947.

The U. S. Agriculture Department states that vegetables need one inch of moisture every seven to ten days for best growth, and farmers want that best growth. Nebraska corn farmers, using irrigation, are now shooting for 125 bushels per acre—up from the 68 to 80 bushels, formerly considered good. The same idea has carried over to the increased production of tobacco, potatoes, pasture lands, fruit orchards, and truck farms in both wet and dry areas.

The drive for more efficient production is accentuated by government control of farm lands. The farmer realizes better yields and greater profits if he invests in irrigation pipe.

Soil reclamation men say that conventional and sprinkler irrigation could open up another 46 million farm acres. They point out that regulated-flow pipe systems use only half the water of open ditches.

1956 Annual Index

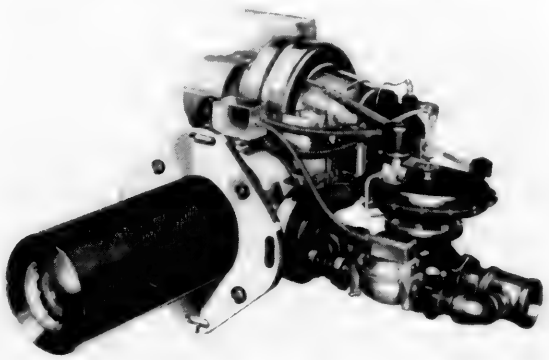
The annual index to the 1956 issues of AIR CONDITIONING, HEATING AND VENTILATING has been completed. Subscribers may obtain copies by requesting the 1956 Index on a postcard.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on page 101 for securing additional information on new equipment and materials described in this department.

Burner Needs No Induced Draft

Because they work against combustion chamber back pressures of 3 in. of water or more, its line of gas, oil, or gas-oil pressure burners for scotch marine type boilers do not require high stacks or induced draft equipment, announces Synchronous Flame, Inc., Walworth, Wis.



Made for 10 to 150 hp boilers, it has 2-stage fire, built-in controls for pre-purge, post purge, and high-low-off fire with automatic air-fuel ratio settings, and full modulation of oil or gas fire as an extra.

Gas and combination burner circuit virtually eliminates possibility of an explosion.

More information? Circle Item 1 on postcard, page 101.

High-Velocity Air Unit

Practical air distribution, where space requirements necessitate high velocity air, is handled by Model CM under-window unit produced by Barber-Colman Co., Rockford, Ill.

Designed for installation under windows or on any wall surface, its front is sloped to prevent the grille from being covered by objects that would prevent proper air distribution. Air volume is controlled from the front of the unit. An adjustable stop sets maximum and minimum positions of the air valve. The unit is furnished with a prime coat. Grille is available in prime coat, bronze plate, zinc plate, baked aluminum enamel, baked metalescent aluminum, and baked tan enamel.

More information? Circle Item 2 on postcard, page 101.

Natural Gas Engines

Natural gas-burning engines from 75 to 500 hp to power central air conditioning equipment is offered by Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis.

A savings in operating costs over equivalent electrical energy up to 50% is claimed in addition to economies possible by taking advantage of lower gas rates offered to users of such equipment during summer months.

In a two-year test, two V-8 H540 engines powered two 100-ton reciprocating compressors to air condition an office building for an equivalent energy cost of 0.8 cents per kwh, less than ½ of electric power rates in that region. Initial installation cost was 5% higher than electric motors and starting equipment, and maintenance costs are higher for gas engines, but operating savings offset the difference many times, says the manufacturer.

Fuel consumption of the engine is 10-12 cu ft per hp-hr. It can be operated at variable speeds, instead of *off-on*. Engines start and stop automatically, varying capacity according to cooling demand, and run unattended. Safety controls are included for its cooling and lubricating system.

More information? Circle Item 3 on postcard, page 101.

Quick Coupling Expansion Joint

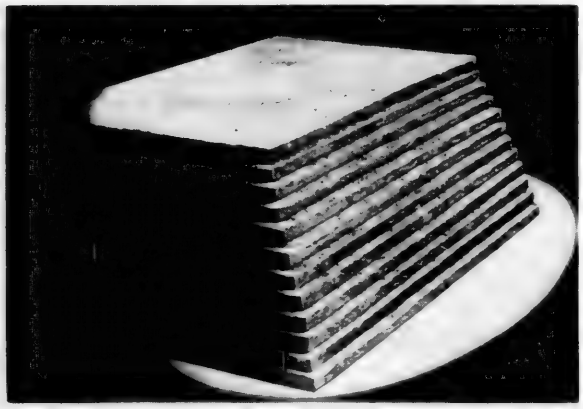
A quick coupling and expansion joint combination, together with all fittings, the use of which eliminates all heretofore necessary pipe threading, is announced by American Flow Control Corp., Houston, Tex. Design utilizes an O-ring and a simple locking device.

The expansion joint, for both plastic and aluminum, requires no threading, welding, or cementing to the lines themselves. It permits the maximum and minimum of expansion and contraction. Any section of pipe may be replaced in minutes without tools, it is claimed. The device is available to manufacturers on a license basis.

More information? Circle Item 4 on postcard, page 101.

Mineral Fiber Board For Ducts

Addition of an insulation board to its line of insulation products is announced by Gustin-Bacon Mfg. Co., Kansas City, Mo. Principal use of the fine spun mineral fiber product is for the insulation of heating, ventilating, and air conditioning duct systems.

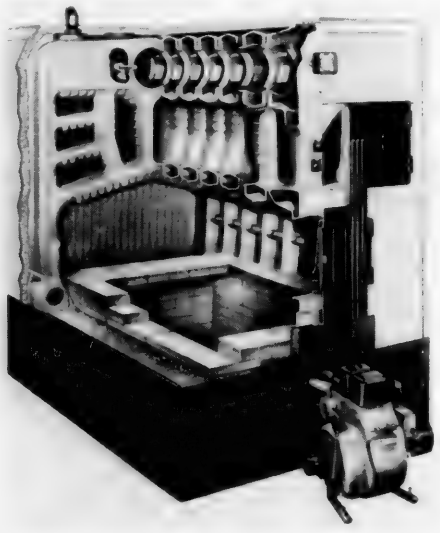


Semi-rigid, with excellent thermal and acoustical properties, it is easy to cut with a knife to conform to irregular shaped or curved surfaces and is not irritating to handle. It is available in 24 x 48 in. sheets and thicknesses of ¾, 1, 1½ and 2 in. For cooling or combination duct work it is available with a factory applied vapor barrier.

More information? Circle Item 5 on postcard, page 101.

Boilers With Extra Surface

Large cast iron boilers and boiler-burner units, Series 47, to eliminate multiple installations of small boilers when providing adequate hot water or low pressure steam for heating industrial plants, institutions, hotels,



and other commercial structures is announced by Heating & Air Conditioning Div., National-U. S. Radiator Corp., Johnstown, Pa.

Ten sizes of cast iron boilers and 8 oil heating units are available. Each of the cast iron boiler sections has 77 finger-like projections which form extra heating surface within flue passes and on the firebox crown. Large nipple ports provide free and uniform water flow between sections. Ground raised beads provide iron-to-iron contact between the sections. Doors also are ground to fit tightly against machined seats.

Oil burners, supplied as a major component of the boiler-burner units, are of the high pressure atomizing type. These gun type burners are claimed to be the design of burner most familiar to installers and service personnel.

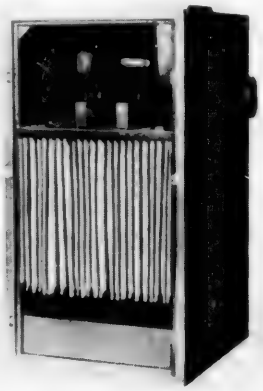
Domestic hot water can be secured from the boiler or the unit when equipped with tankless or storage tank heaters, available from the company. Both boiler and boiler-burner unit have a silver green enameled jacket which encloses a complete wrapping of glass wool blanket insulation, meet ASME boiler code construction, and are I-B-R rated.

Cast iron boiler net I-B-R ratings range from 2500 to 7600 sq ft for steam, and from 4145 to 12160 sq ft for water. The boiler-burner unit has net I-B-R ratings for the 8 models that extend from 2500 to 6400 sq ft for steam, and from 4145 to 10240 sq ft for water.

More information? Circle Item 6 on postcard, page 101.

Dust Collectors Redesigned

Its series 80 cabinet cloth-filter dust collectors, redesigned to increase capacity over 250%, are available from Torit Mfg. Co., St. Paul, Minn.



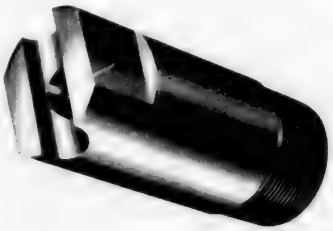
For jobs producing heavy quantities of dust, chips, and shavings, each collector, with new capacity of 2 cu ft, has 150 sq ft of cloth filtering area, with filters made from fine-woven cotton, chemically treated for spark resistance, and each cabinet measures 49¼ x 28¼ x 28 in. Internally mounted motors and fans move from 580 to 1100 cfm of air through the filters at speeds of 5,000 to 8,000 fpm.

All models in the series have a manual starter with overload protection, foot pedal for shaking filters clean, solid steel cabinets and inside exhaust (where regulations permit). Explosion-proof motors and other refinements are available at extra cost.

More information? Circle Item 7 on postcard, page 101.

Large Capacity Spray Nozzle

A new, large capacity flat spray nozzle, the 2-U-Veejet, is added to the line of Spraying Systems Co., Bellwood, Ill. Capacity of this nozzle ranges from 73 gpm at 15 psi to 330 gpm at 300 psi. It is supplied in two types of spray angles.



The nozzle is designed free of cores, vanes or obstructions of any kind and is made with a 2-in. male pipe connection. Designed for heavy duty cooling and washing operations, the nozzle is also suitable for other applications where a large capacity flat spray is desired. It is made standard in brass and can be supplied in other materials upon order.

More information? Circle Item 8 on postcard, page 101.

School Air Blender System

Designed primarily for installation in commercial and public buildings, the Air Blender, now adapted to schoolroom application, and designed to meet all the requirements of modern school architecture, is offered by Sturtevant Div., Westinghouse Electric Corp., Hyde Park, Mass. The system distributes heated fresh outdoor air from one central supply source to classroom under-window units.

Classroom heating is obtained by blending heated recirculated classroom air with tempered air from the central supply unit. The recirculated air is drawn into the unit through a steam or hot water finned-tube heating coil. The heating coil is automatically controlled to raise the temperature of the passing air for proper blending. The blender unit acts as a convector for effective stand-by heating requiring no operating fans in shutdown periods.

For ventilating purposes air is composed in proportionate parts of recirculated air and air from the central supply unit. The volume of central supply air may be all fresh outdoor air or a mixture of outdoor and recirculated building air. The proportion is automatically controlled, providing the most desirable air change with no room temperature variation.

Ventilating cooling compensates for classroom heat gains due to solar radiation through large windows by providing fresh outside air from the central supply unit. Cooling is limited only by the cooling capacity of the outside air.

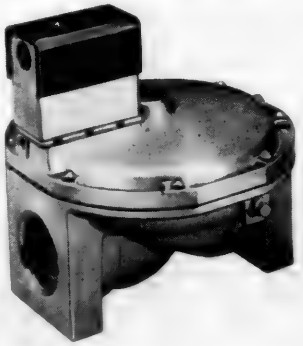
By the addition of cooling coil and refrigerating cycle at the central supply source air conditioning is obtained. This requires no changes or additions to supply ducts or classroom units.

The Air Blender system has no outside air inlets in classroom walls. A factory built assembly of fan, heating coil, and filter as a self-contained heating and ventilating unit comprises the central station supply apparatus. There are no fans, filters, motors, or electrical wiring in the classrooms. The central supply unit insures reduced service, inspection, simple maintenance and quieter classrooms.

More information? Circle Item 9 on postcard, page 101.

Two Diaphragm Gas Valves

Addition of two models to its line of relay-operated diaphragm gas valves is announced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. They will become the firm's basic line-voltage models for commercial and industrial burners of 5 lb rating. Model V-48F,



is furnished with position indicator but without manual opener and is designed for final shut-off service. Model V-48G is a general-purpose type and is available with manual opener but without position indicator.

Both are available in 2, 2½, and 3-in. sizes and can be used with all gases including LP and high sulphur-content gas.

According to the firm's engineers, the models make available a complete line of low-pressure and high-pressure types for large domestic, commercial and industrial applications in both 8-oz and 5-lb models. All have large valve actuator porting and increased capacity, are designed for right or left-hand installation, and use a weight and spring-loaded diaphragm for dependable closing. Electrical parts are mounted outside the gas stream and terminals are provided for each electrical connection.

More information? Circle Item 10 on postcard, page 101.

Ductile Iron Fittings

A line of K pipe lock couplings, screwed and flanged fittings, and companion flanges is offered by The Kuhns Bros. Co., Dayton, Ohio.

It is said that the strength of ductile cast iron has permitted the design of lighter fittings, desirable where weight is an important factor, and that its resistance to corrosion exceeds that of gray cast iron, due to the characteristic spheroidal, rather than laminar, arrangement of the included graphite. Catalog is available.

More information? Circle Item 11 on postcard, page 101.

Centrifugal Safety Switch

A device for protecting gas furnace burners against blower failure is the Syncro-Snap centrifugal switch manufactured by Torq Engineered Products Co., Bedford, Ohio. If blower speed falls below normal, the centrifugal switch actuates controls which immediately shut off the gas flow.

The switch is mounted on the blower shaft and operates in conjunction with a mercury switch assembly. In this case it is accurate to $\pm 3\%$ of the blower rpm, the manufacturer claims, and operates on speed alone, independently of voltage, load or heat conditions.

More information? Circle Item 12 on postcard, page 101.

Air Vent Has Up-Flow Design

In accordance with the latest NBFU standards, the No. 45 Up-Flow Air Vent, now being marketed by Universal Valve Co., Elizabeth, N. J., eliminates the dangers

of accumulating vapors in underground storage tanks by permitting the vapor to escape in an upward direction. This upward projection of vapor eliminates the hazards of fire and explosion possible with down-vented gasoline vapors. Oversize area of the air vent allows vapors to escape rapidly without any restriction to flow even under tight-fill service practice.

Simple three piece construction includes hood, screen and body which are assembled with a single center screw. With the exception of the removable brass screen all parts are made of aluminum. Design features include a three spout, cone shaped hood which provides quick escape route for drain water. Spouts also serve to support hood on body.

Standard 40 mesh brass screen seats in an internal annular groove at base of body and prevents ingress of dirt and moisture. The body, only slightly larger than the pipe, can be installed close to the wall, has no threads, is held firmly in place by tightening screw, and has an internal annular groove which collects moisture and drains it through a hole in side of body.

More information? Circle Item 13 on postcard, page 101.

Control for High Temperatures

A pilot type thermostatic controller for high temperature applications is produced by Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn.

Standard temperature ranges are 250 to 450 and 350 to 550 deg F. The company can supply any 200 deg range from 50 to 600 deg. The controller measures 3 13/16 in. wide and 19¾ in. long, and is recommended where compressed air is used as the pilot supply.

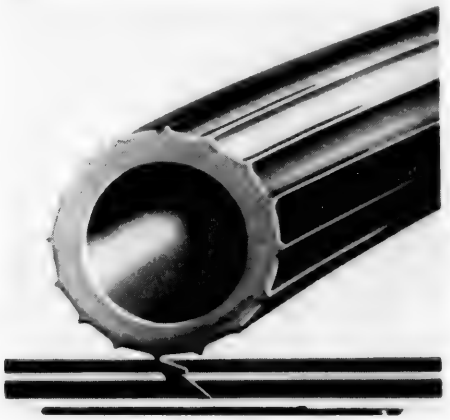
Its thermosensitive tube is made of stainless steel to withstand corrosion as well as temperature and erosion. A finned section keeps the pilot valve and adjustments cool on the high temperature control applications.

Accurate temperature regulation of liquids or air when used in conjunction with valves, dampers or other controls is provided for control systems of instantaneous water heaters and other applications in which rapid response and adjustable control characteristics are required. The controller may be installed in any horizontal or vertical position. Any change in temperature at the thermal element activates a small pilot valve, which in turn varies the pressure applied to a control valve or other final regulating device. The effective control differential of the new device may be adjusted quickly in the field to any spread between 5 and 25 deg with an ordinary screw driver.

More information? Circle Item 14 on postcard, page 101.

Ribs Protect Pipe Wall

Flexible polyethylene plastic pipe is offered with a series of raised ribs extending at close intervals throughout the outside circumference of the pipe by Manufacturers Corp., Mansfield, Ohio. Termed Protecto-Rib, the product's raised ribs give protection to the pipe wall against abrasion and scarring in shipping, warehouse handling, installation and service.



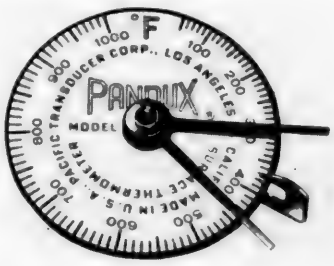
Other advantages claimed are that the ribs make stacking of coils easier and surer, as the coils will not slide when stacked, in contrast to this inconvenience encountered with smooth walled pipe. Furthermore, the ribs give more positive seating of pipe clamps, as the cold-flow of the plastic ribs under clamp pressures acts as a lock which prevents possible clamp movement. Since these ribs add reinforcement to the wall thickness of the pipe, resistance to burst and tear is greater.

The price of this pipe is no more than that of regular smooth-wall pipe.

More information? Circle Item 15 on postcard, page 101.

Thermometer Holds Data

Maximum and minimum excursions of the thermometer over any desired period of time are shown on a maximum-minimum surface temperature stainless steel thermometer manufactured by Pacific Transducer Corp., Los Angeles, Calif.



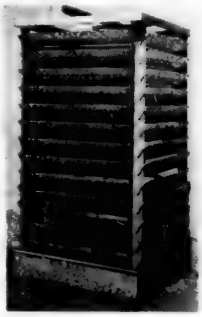
Maximum and minimum pointers can be re-set whenever a reading is taken. The diameter is 1¾ in. overall, and the unit weighs ½ oz. It reads temperature of all surfaces, such as dies, heavy sheet metal, furnace skins, and large super-heated pipes; provides a maximum and minimum record of temperature in furnaces, ovens and other enclosed spaces, as well as non-corrosive liquids and gases, up to 1000 deg F.

An alnico magnet is provided for attachment to ferrous surfaces when the thermometer is used in a vertical position. It comes calibrated from the factory to within plus or minus 2%, and can be re-calibrated by the user when necessary.

More information? Circle Item 16 on postcard, page 101.

Tower Is Erected Quickly

An all hot dip galvanized steel natural draft cooling tower designed for rapid erection is available from Dover Mfg. Co., Independence, Mo.

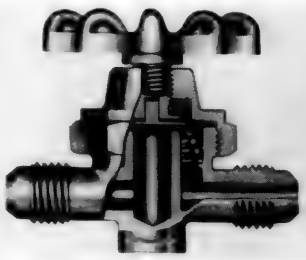


No bolts are used. The tower is held together with an adjustable tie rod that extends from the header pipe down to the center of the basin. The erection procedure is merely to fit four galvanized corner posts into corner brackets in the basin, place the crown on top of the posts, place the header pipe into position and attach the adjustable tie rod. Once tightened, the tie rod holds the entire assembly together. Then, galvanized louvers are simply slipped into the slots in the corner posts, and the tower is ready to be connected to the water piping system.

More information? Circle Item 17 on postcard, page 101.

Diaphragm Packless Valve

A compact diaphragm packless valve engineered for unrestricted flow is announced by Henry Valve Co., Melrose Park, Ill. Known as Type 515 with flare connections and type 516 with ODS connections is recommended for refrigeration service, charging boards, gage shut-off valves, and vacuum applications; also for control of industrial fluids which are hazardous and expensive.



They are available in ¼ through ⅝ in. flare and ODS sizes, and can also be furnished with other types of end connections. Design includes light weight, forged brass body with integral mounting flange, full capacity ports with inlet and outlet ports in line, non rotating floating bearing plate, teflon diaphragm, stainless steel spring, and hexagonal wrench grip on valve bonnet.

More information? Circle Item 18 on postcard, page 101.

Air Diffuser Units

Two new series of straightline air diffuser units for use with high temperature differential systems have been announced by Anemostat Corporation of America, New York, N. Y. The SL-100 series induces approximately

100 cfm of room air for each 100 cfm of prime air; the SL-ASP induces approximately 40 cfm of room air for each 100 cfm of prime air.

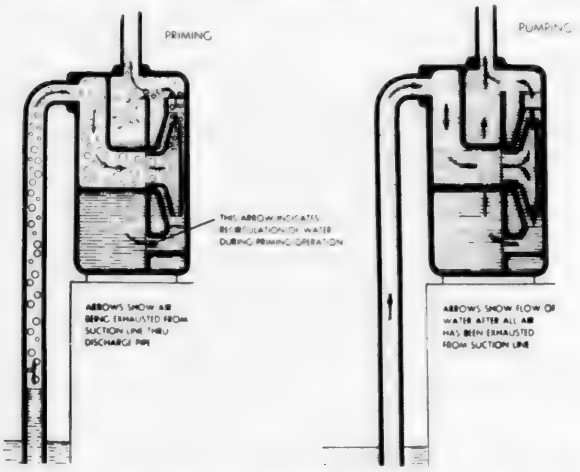
The units can be used for ceiling, wall, under the window, or sill applications. The SL-ASP is designed for temperature differentials of up to 20 deg F; the SL-100 for differentials of up to 30 deg.

The units counteract the disadvantage of low rate of air change in the room associated with high temperature differentials by using the kinetic energy in the air to induce room air at the units to augment the prime supply. Diffusers in these two series are available in a variety of sizes and lengths.

More information? Circle Item 19 on postcard, page 101.

Pumps Have No Valves

Its line of electric powered, self priming, closed and open centrifugal pumps with no check or other type valves or large chambers or reservoirs is presented by Goulds Pumps, Inc., Seneca Falls, N. Y. The volute



design enables them to exhaust a suction line with only an initial priming charge of liquid in the casing.

One volute discharges water and entrained air into the air separation chamber. The air is then separated and passes out the pump discharge, the water being re-circulated into the other volute. No re-circulation through the impeller eye is employed. When the water enters the pump suction and the impeller picks up the load both volutes become discharges and operation is in all respects the same as a conventional centrifugal pump.

The casing is so designed that upon stopping the pump the discharge and suction lines may be allowed to drain back into the source of supply and an adequate liquid charge to re-prime will be retained in the pump casing.

Four non vapor-locking models, Fig. 3638, 3639, 3738, and 3739, are available with electric motor power supplies ranging from ½ to 5 hp. These pumps have capacities up to 120 gpm for suction lifts up to 25 ft and heads up to 135 ft.

More information? Circle Item 20 on postcard, page 101.

Boiler Uses All Fuels

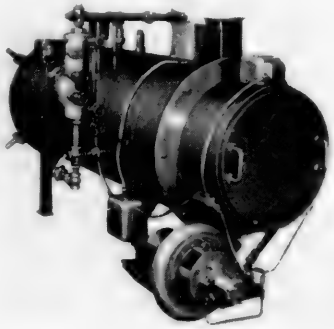
Announcement of a cast iron boiler with a performance range of 2630 to 6380 sq ft net steam rating, or 4345 to 10,205 sq ft net water rating, that can be used with all fuels, is made by Plumbing and Heating Div., American Radiator & Standard Sanitary Corp., New York, N. Y.

Available in 8 sizes, in 5 to 12 sections, it is designed as an external type domestic water heater. A steel pedestal base eliminates the need for floor pit and fire brick pedestal base. Cast iron sections are tested at the factory at 2½ times normal operating pressure.

More information? Circle Item 21 on postcard, page 101.

Compact Steam Generators

Junior additions to the Steam-Pakette line of packaged steam generators are announced by York-Shipley, Inc., York, Pa. Models SPH56-10B (10 hp) and SPH56-15B (15 hp) may be fired by either light oil or gas, or by a combination of oil and gas. Both models have 49 sq ft



of heating surface and are for high pressure service only. No essential control feature has been omitted in the effort to achieve compact size.

Of two-pass construction, which requires no baffle to divert the flow of combustion gases, it is rated at a maximum allowable working pressure of 150 psig. Small size breeching connection contains stack switch. A small flue vent is required.

Compact assembly of motor, blower, fuel pump and fuel line solenoid valve attaches to the supporting bracket as a single unit by means of four bolts. Wedge pin clamps and asbestos rope sealing make it easy to remove the rear end of the boiler for inspection and cleaning and to close it again.

More information? Circle Item 22 on postcard, page 101.

Large Sized Blue Print Clamps

Two large sizes of blue print holders to be used in the Glider blue print rack in addition to the regular size plan holder, is offered by Momar Industries, Chicago, Ill. The regular size is 24 in. long, but the new sizes are 36 and 48 in. long.

The plan holder is designed to hold any thickness of set without punching holes in blue prints. Whole sets or single sheets of blue prints can be slipped into the holder and clamped by turning the thumbscrews. This adjustment permits easy removal as well as insertion of prints or sets of prints.

More information? Circle Item 23 on postcard, page 101.

Electric Radiant Heating

Equipment for electric radiant heating is now offered by Wiring Device Dept., General Electric Co., Providence, R.I. The entire heating plant consists of heating wires for

embedment in the ceilings, thermostats and, of course, connections to the electric power supply.

Houses equipped with electric radiant heating need no furnace, fuel tanks, chimney, heating pipes or flues. Space in basements or utility rooms usually required for such equipment can be used for other purposes. In addition, since there are no radiators or other visible heating outlets, there is great freedom in room design and decoration.

Another feature of electric radiant heating is that temperatures in the house are controlled by individual thermostats in each room. The home-owner can vary room temperatures according to his personal preference. Cool bedrooms and kitchen, relatively warm bathroom and nursery, and 70-degree warmth in the living room, or any variation the home-owner desires, are all made possible by the new system.

The thermoplastic-insulated heating wires are available in a variety of lengths and wattage ratings for both 240 and 120-volt power supplies. They can be applied equally well to plaster ceilings or laminated gypsum wallboard ceilings. They are stapled in place, connected to thermostats, then covered with plaster or laminated gypsum wallboard. Successful installations have also been made in concrete floors. According to the company, the heating wires distribute their warmth evenly throughout the room, with a temperature variance from ceiling to floor of four degrees or less.

More information? Circle Item 24 on postcard, page 101.

Elongated Rim Blowout Bowl

The Chancellor, a new wall-hung blowout bowl with elongated rim, is available from Universal-Rundle Corp., New Castle, Pa. It is made with either 1½-in. back spud

or 1½-in. top spud for use with exposed or concealed flushometer.

The bowl has no dirt collecting crevices, the floor is totally unobstructed, and the adjustable chair carrier holds entire unit safely and firmly. The color is white.

More information? Circle Item 25 on postcard, page 101.

Thermostat Meets Code Needs

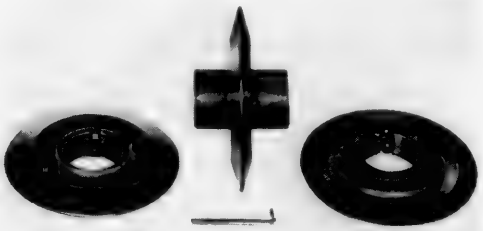
For localities that require a double pole disconnect switch located at each thermostat, for such applications as cable heat, glass panels, electric baseboards, and rubber panels, an electric heat thermostat is offered by White-Rogers Co., St. Louis, Mo. At the *off* dial position, both sides of the 240-volt line are disconnected. No temperature change will close the contacts. Sensitive reaction to both radiant heat and air temperatures is obtained. The color of the element and case is of a hue that has heat absorption qualities similar to that of the human body. This balancing of radiant temperature with air temperature maintains constant comfort. Switching mechanism mounts directly into any standard 2 x 3 in. outlet or conduit box. Temperatures from 55 to 85 deg are maintained by this unit which is rated at 5000 watt, 240 volts a-c.

More information? Circle Item 26 on postcard, page 101.

Sheaves Adjust Quickly

Introduction of one and two-groove (illustrated in exploded view) sheaves for quick and easy speed adjustment of its V-belt drives in A and B sections has been announced by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Designed for low horsepower applications, the sheave provides for increased maximum design horsepower. For example, the new sheave, the same size as a former two-



groove B section cast iron adjustable sheave. will handle approximately three times more horsepower.

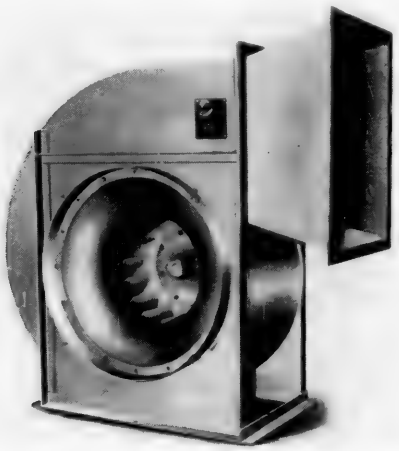
Keys transmit all rotational torque, i.e., from shaft to hub and hub to discs. Set screws no longer bite into threads.

The flexibly joined set screw and key give a positive lock between the movable discs and stationary hub. Because the key and set screw always remain joined and in place, they cannot drop out during adjustment nor can they move out of alignment.

More information? Circle Item 27 on postcard, page 101.

Large Volume, High Pressure Fan

A radial blade fan having high volume and pressure characteristics is offered by Buffalo Forge Co., Buffalo, N. Y. It offers mechanical efficiency above 78% over a broad range, and is highly suitable for handling dust-laden air. These characteristics result from inlet-to-outlet streamlining and new radial blade design.



Inlet is a smoothly curved bell shape to allow air entry with minimum turbulence, permitting optimum performance with or without inlet guide vanes. For accurate volume control, fan is available with variable inlet vanes of curved, cantilevered design, with no center ring to impede air flow, and with the linkage mechanism completely out of the air stream. Performance is not reduced when the fan is supplied with this volume control.

Addition of a divergent outlet provides a gradual, diverging path from cutoff to duct, permitting an easy, gradual change to static pressure. In addition to this radial wheel type, a model with wider and closer-spaced blades, a higher capacity, lower pressure type; and one with narrower and deeper blades, a higher pressure type, are offered.

More information? Circle Item 28 on postcard, page 101.

Gas Burner Test Kit

Included in this kit for gas burner service, manufactured by Bacharach Industrial Instrument Co., Pittsburgh, Pa., is a complete set of instruments for testing and adjusting all types of gas burners in accordance with AGA standards and municipal ordinances.

A carbon dioxide indicator, stack thermometer, draft gage, oxygen indicator, carbon monoxide detector, and two slide rule calculators are packed in a metal carrying case.

The neutral pressure point indicator is used when

adjusting the draft head on gas conversion burners and the gas pressure gauge, a U-type manometer, when checking and adjusting manifold pressure. The oxygen indicator is needed on installations which must meet municipal code requirements specifying a flue gas test for oxygen as well as for CO_2. The carbon monoxide detector is required to ascertain that the burner is set for complete combustion (defined as less than .04% of carbon monoxide in the products of combustion).

One slide rule is for correlating CO_2 readings and stack temperatures to show at a glance the percentages of actual combustion efficiency and the stack loss. The other is used to determine orifice size or orifice pressure for required heat input per orifice, or vice versa.

More information? Circle Item 29 on postcard, page 101.

Cooling Twin Mounts Overhead

Twin to its line of unit heaters, an air conditioner whose cooling coil suspends from the ceiling to save floor space in stores, offices, and restaurants is announced by Bryant Mfg. Co. Div., Carrier Corp., Indianapolis, Ind.

Available in 2, 3, and 5 hp models, it uses no water. (The heating twin is available in eight sizes, 50,000 to 225,000 Btu per hr.) The air-cooled compressor can be located outdoors and connected to the suspended coils by small copper tubing. It can be adapted to duct distribution.

More information? Circle Item 30 on postcard, page 101.

Foamed Plastic Insulation Board

A rigid, foamed plastic insulation board, Armalite, that combines light weight and moderate cost with relatively high compressive strength and high insulating efficiency is announced by the Armstrong Cork Co., Lancaster, Pa.

In refrigerated truck and trailer bodies, and in refrigeration equipment, the material is designed to cut gross weight with an increase in insulating effectiveness. In cold rooms, it provides efficiency at moderate cost.

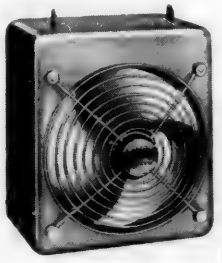
The material has more than sufficient strength for use under concrete wearing floors, as free-standing walls in cold rooms, and in walls and floors of truck and trailer bodies. It may be used at temperatures from minus 50 to 160 deg F. It has a k factor of 0.24 at 60 deg mean temperature, and an average modulus of rupture of 24 psi.

The product is applied by the cold erection method, using an adhesive, with additional support supplied in cold rooms by hardwood skewers or galvanized nails. Multiple layer construction is recommended by the manufacturer.

More information? Circle Item 31 on postcard, page 101.

Electrical Unit Heaters

An electrical unit heater for offices, stores, and industry is developed by Ilg Electric Ventilating Co., Chicago, Ill.



The heater uses a non-glowing, black heat type element, steel covered and protected against overheating by a built-in thermal cut-out. Safety design eliminates bare wires or terminals in the air stream. Sealed bearing motor is totally enclosed.

Units are designed for continuous or automatic control to maintain temperatures as required. For normal service sizes range from 1½ to 7½ kw. Extra heat capacity units range from 9 to 15 kw. The entire heater unit, including motor, coils, and fan, is covered by the manufacturer's guarantee.

More information? Circle Item 32 on postcard, page 101.

Thermostatic Gas Control

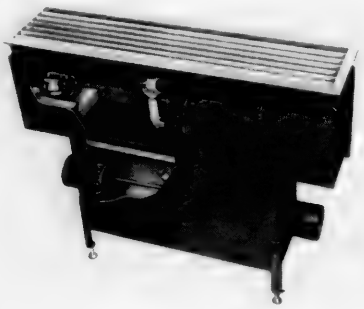
A new thermostatic control, Unitrol 110-S, designed for installation in the cold air return of gas-fired wall and room heaters is produced by Grayson Controls Div., Robertshaw-Fulton Controls Co., Long Beach, Calif. It includes a combination pilot and main burner control valve, an automatic pilot with 100% shut-off feature, and a sensitive thermostat.

The control is a cold air return thermostatic device. Installed at the base of the wall heater, it senses and reacts to air temperature at floor level which is returning to the bottom of the heater for recirculation. Since air movement across the floor and into the heater base is the most active and rapidly moving air in the room, the company points out, the quick response to temperature changes by the thermostatic element provides comfortable control with little variation.

More information? Circle Item 33 on postcard, page 101.

Conditioned Air Flow Control

A new method of introducing a constant volume of conditioned air into rooms, offices and other spaces is developed by Anemostat Corporation of America, New York, N. Y. The method makes volume control automatic and continuous. Used with high velocity, dual duct air-conditioning systems, variations of total air flow into a living space are eliminated.



The new method is similar to the company's standard system of draftless diffusion of air. Hot and cold air are brought by separate ducts to an attenuator box. Entry of air into the box is controlled by rocket socket valves. The degree of opening of the hot or cold valves is controlled by a thermostat and by a pressure sensitive membrane, both acting through a system of mechanical linkages. The control of air volume is extremely close, being less than one-tenth of an inch wg.

The advantage of the new method is the elimination of varying air volume even though the pressure in the dual ducts may vary widely. If the system becomes unbalanced for any reason, the quantity or volume of air admitted to any office or room is held constant.

More information? Circle Item 34 on postcard, page 101.

Shallow-well Pump-Tank Package

Self-priming operation combined with tank-over-pump packaged design of its Super-Prime Econojet water system is introduced by Barnes Manufacturing Co., Mansfield, Ohio.

Built for shallow-well operation, entire unit, including tank, pump and motor, is 30 in. long, 10 in. wide, and has a 790 gph capacity with suction lift of 10 ft, and a 420 gph capacity at 25 ft suction lift. Close coupling of pump parts serves to reduce water travel to a minimum distance and eliminates vibration.

Unit is available in $\frac{1}{3}$ and $\frac{1}{2}$ hp sizes. Both are base-mounted with a 10 gal tank, including air volume control, pressure switch, and improved translucent air separator. Water system is based on principle of self-priming operation developed by the company's engineers in 1955.

More information? Circle Item 35 on postcard, page 101.

Underground Pipe Protection

Tri-sul-ite is the new name for the natural mineral gilsonite underground pipe protection formerly marketed under the name of Insul-ite by G. S. Ziegler & Co., Great Neck, N. Y. The product has been widely specified and used by heating engineers and contractors in their designs of underground piping systems for utilities, industrial plants, institutions and other multiple building projects with centralized heating plants. It is one of the few natural minerals which have been found highly successful for providing complete protection for underground pipes.

The new name, the company feels, is more suitable for its product. Properly installed and cured, it forms three zones of corrosion protection, water impermeability, and insulation.

More information? Circle Item 36 on postcard, page 101.

Coil-Valve Used 3528 Ways

A multi-voltage coil for use with its line of solenoid valves is announced by Jackes-Evans Mfg. Co., St. Louis, Mo.

Twelve common fluids, including Freon, steam, and brine, can be handled through 42 valve styles and capaci-

ties with any one of 7 electrical circuits, giving 3528 different applications. Valves range from 7/64 to $1\frac{1}{2}$ in. port sizes and are suitable for temperatures up to 225 deg F.

A data plate showing correct hook-up for each requirement is supplied with each valve.

More information? Circle Item 37 on postcard, page 101.

Larger Unit Added to Line

Addition of a 15 hp packaged air conditioner, Model 1503, to its 1957 line of 3, 5, and 7½ hp units is announced by the York subsidiary of Borg-Warner Corp., York, Pa.

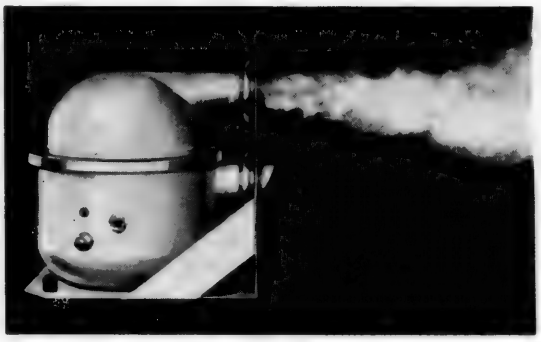
Styled in blue with scotch-grain finish for installation in the conditioned space, the unit is designed for the multi-space market: shopping centers, supermarkets, hotels, and office buildings. Step control is provided to match the output to the needs of the space. Individual refrigerating systems are hermetically sealed.

For those applications requiring ductwork but with low head room, unit has a rotating fan section. The fans are turned forward to throw the air directly out the front and into the front-mounted supply duct. Ductwork can be applied in a variety of arrangements and steam or hot water heating coil and humidifier assemblies are available.

More information? Circle Item 38 on postcard, page 101.

Centrifugal Humidifier

Announcement of its improved Model WF humidifier is made by Walton Laboratories, Inc., Irvington, N. J. Producing a water vapor mechanically by means of a



centrifugal atomizer, approximately 10 gal of water are evaporated per day into the air stream.

Positive results are promised with burner capacities up to 140,000 Btu per hr output without coils, nozzles, jets, or plates. Of non-ferrous construction, it is electronically balanced to eliminate noise and vibration.

More information? Circle Item 39 on postcard, page 101.

New Line of Furnaces

A new line of furnaces, all adaptable for the addition of summer air conditioning, is announced by Worthington Corporation, Harrison, N. J.

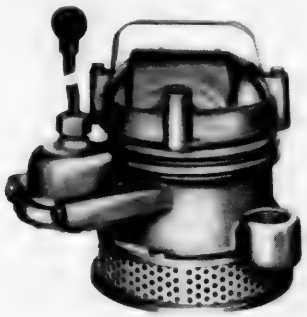
The new furnace units are available in high-boy, lo-boy, counterflow and horizontal design, the latter adaptable for suspension mounting; can be belt or direct driven; and include a line of lower-priced models for use in areas where cost is of major importance.

Available in about fifty different types and sizes, ranging from 80,000 to 350,000 Btu per hr, the units are gas or oil fired. A wide scope of optional features makes the units adaptable to accommodate varying conditions of operation for residential and commercial applications.

More information? Circle Item 40 on postcard, page 101.

Submersible Sump Pump

A new submersible sump pump with a ⅓-hp capacitor motor and an automatic pressure type control switch is announced by Weil Pump Co., Chicago, Ill. This pump is designed to operate completely submerged with a hermetically sealed motor.



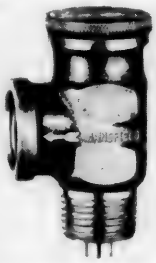
The pump shaft is stainless steel and the impeller is bronze. Discharge size is 1¼-inch dia with discharge heads to 24 ft and capacities ranging up to 60 gpm. The pump is furnished with 8 ft of power cable including a grounded plug, and is easily installed in a metal, tile, or concrete sump.

This compact, sturdy unit is engineered for one million starts without attention and guarantees trouble-free operation.

More information? Circle Item 41 on postcard, page 101.

Water Tank Relief Valves

A new line of temperature and pressure relief valves, the 450 Series, is announced by Mansfield Sanitary Pottery, Inc., Perrysville, Ohio.

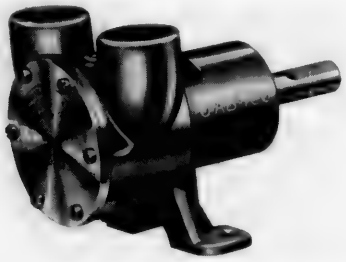


Six units will comprise the series and the first ones to reach the market are the 450-P for pressure relief only and the 451-TP with fusible plug for temperature and pressure relief. Both valves are AGA listed and have a rating of 150,000 Btu per hr. The set pressure is 125 psi, and the fusible plug melts at 210 deg F.

More information? Circle Item 42 on postcard, page 101.

Pump Series of Four Sizes

Production of its vertical port, self priming pump series in ⅜, ½, ¾ and 1 in. (illustrated) port sizes, is announced by Jabsco Pump Co., Burbank, Calif. Units are designed for both low and high speed operation with pulley or direct motor drive and are equipped with sealed and lubricated ballbearings.



All models are suitable for general transfer applications in the marine, farm, industrial, and chemical industries. They have one moving pumping part, and can be serviced without removing the pump from installation. All metal parts are constructed of marine bronze.

More information? Circle Item 43 on postcard, page 101.

Cooling Tower Pumps

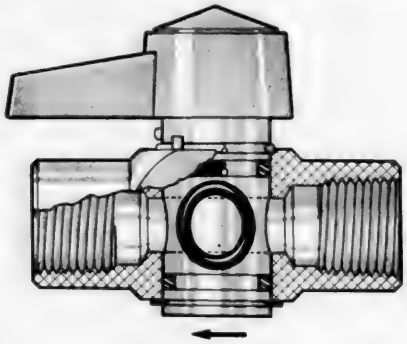
A line of centrifugal pumps, Series AC, is being manufactured by Ace Pump Corp., Memphis, Tenn. The pumps, while being applicable to almost any pumping situation due to compact size, short shaft construction, and wide range of rated horsepower and discharge capacity, are especially adaptable for cooling tower installations. Data for pump selection are available.

More information? Circle Item 44 on postcard, page 101.

Plug Valve Uses O-Rings

A new plug valve that provides leakproof shut-off operated by a handle that opens and closes against pressure with no effort is being manufactured by Circle Seal Products Co., Inc., Pasadena, Calif.

The design of the plug features the use of three O



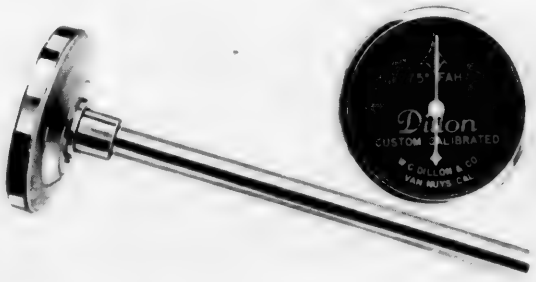
rings which eliminate adjusting nuts and springs. In the closed position, one O ring contained on the surface of the plug, 90 deg from the flow passage through the plug, serves as a flow seal. This flow seal ring surrounds the inlet port and provides tight shut-off. In the open position, the valve is fully ported and allows a straight-through flow passage (see illustration). Static O rings at the top and bottom of the plug and around its circumference prevent stem leakage.

The plug valve is made of brass and is available in ¼ inch female pipe connections.

More information? Circle Item 45 on postcard, page 101.

Thermometer 100% Accurate

Unlike standard thermometers which encompass a wide temperature range and which must necessarily operate within a limited accuracy tolerance, there is no variation, plus or minus, in the readings of this custom calibrated bi-metallic instrument manufactured by W. C. Dillon & Co., Inc., Van Nuys, Calif.



Calibrated for 100% accuracy at any *single* desired point between minus 40 and plus 1000 deg F or minus 10 to plus 300 deg C, it satisfies a demand for a thermometer that is dead accurate at a specified point and where other markings might be confusing.

Dial diameter is $1\frac{7}{16}$ in. Model illustrated has plain bushing. However, threaded connections are available Stem lengths vary from 2½ to 70 in. All parts are type 304 stainless steel. A notarized certificate of calibration is furnished with each instrument attesting to 100% accuracy.

More information? Circle Item 46 on postcard, page 101.

Timer Permits Varied Cycles

A new timer for controlling *on-off* cycles from 10 seconds to 12 minutes is announced by International Register Co., Chicago, Ill. Known as the Intermatic Cycler-12, the timer is recommended for use on ventilating fans, pumps, process timings, and other industrial uses requiring flexible cycles of operation.

Providing a wide variety of repetitive timings, the time dial will accommodate up to 12 sets of *on-off* trippers. In addition to its flexibility of operation, the device also features other extras such as manual control without interrupting the automatic cycle, snap-out mechanism, black on yellow dial for more accurate setting, and trippers that are easily added or removed with the twist of a finger.

More information? Circle Item 47 on postcard, page 101.

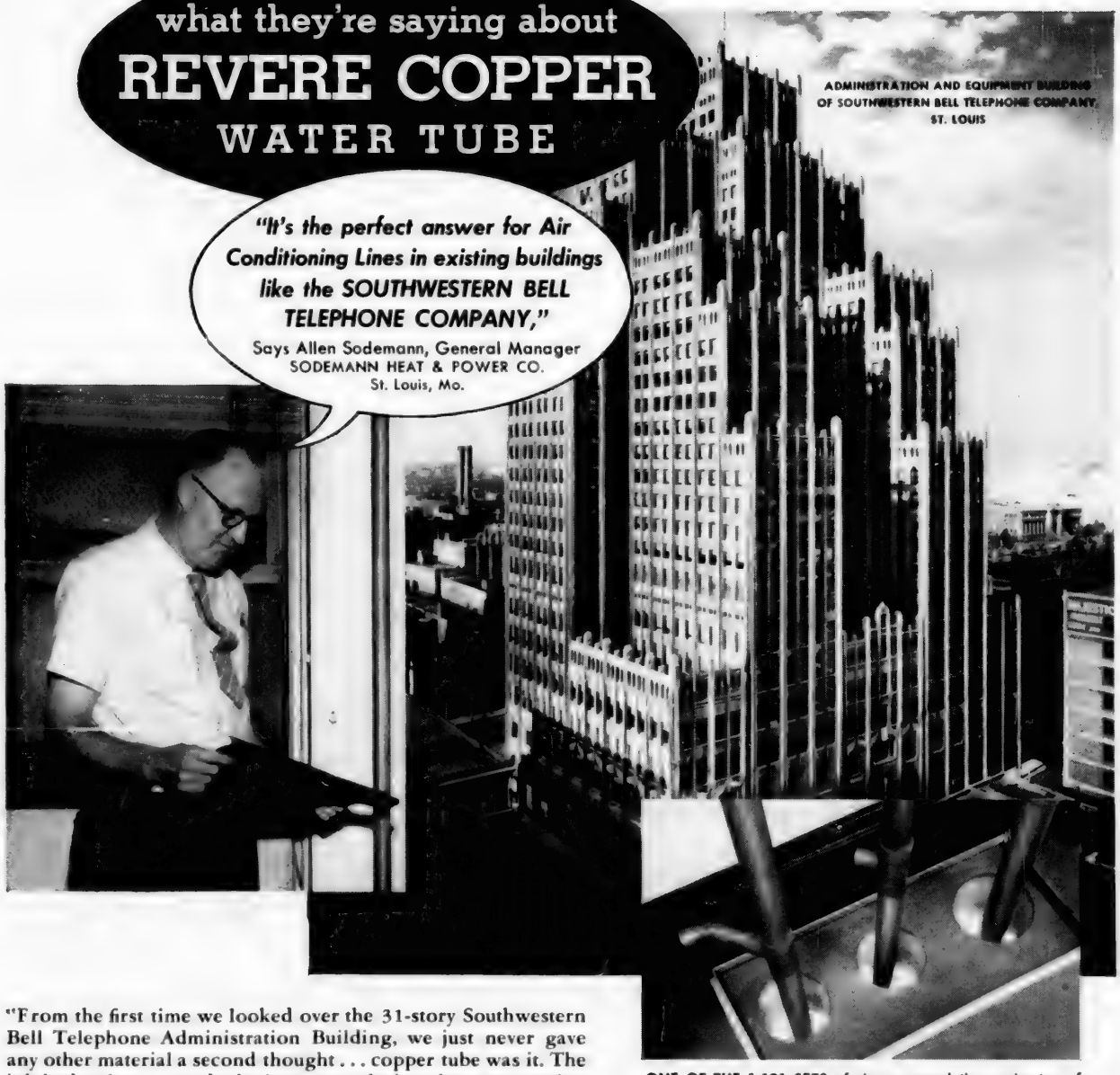
(*Continued on page* 122)

what they're saying about

REVERE COPPER WATER TUBE

"It's the perfect answer for Air Conditioning Lines in existing buildings like the SOUTHWESTERN BELL TELEPHONE COMPANY,"

Says Allen Sodemann, General Manager
SODEMANN HEAT & POWER CO.
St. Louis, Mo.



ADMINISTRATION AND EQUIPMENT BUILDING OF SOUTHWESTERN BELL TELEPHONE COMPANY, ST. LOUIS

"From the first time we looked over the 31-story Southwestern Bell Telephone Administration Building, we just never gave any other material a second thought . . . copper tube was it. The job had to last . . . and what's more enduring than non-rusting copper? The installation had to be made as fast as possible and with the minimum of rip-up. With the long lengths of copper tube and solder fittings requiring no wrench room or thread cutting, copper again was the answer."

It is these same attributes that make Revere Copper Water Tube the first choice of contractors, architects and engineers for radiant panel heating, hot and cold water lines, processing lines, underground service lines, drain, waste and vent lines. See your Revere Distributor for your needs.

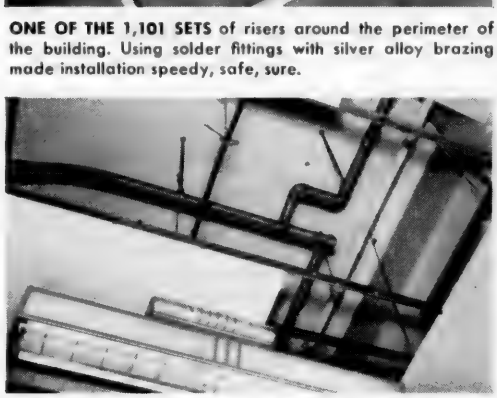
REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

COPPER * BRASS 18 01 * REVERE * ALUMINUM



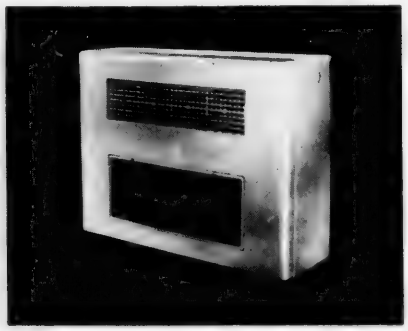
ONE OF THE 1,101 SETS of risers around the perimeter of the building. Using solder fittings with silver alloy brazing made installation speedy, safe, sure.

REVERE COPPER WATER TUBE is made to order for small spaces like those encountered in this false ceiling. No wrench-room needed when you use Revere Copper Water Tube. The 45,000 lbs. of Type "L" Revere Copper Water Tube used were supplied by GRINNELL COMPANY, Revere Dist.

(*Continued from page* 120)

Yearlong Air Conditioning

An air-conditioning system is available, from Remington Corp., Auburn, N. Y., that eliminates the need for central compressors and water towers for peripheral heating and cooling of office buildings, hotels, apartment houses and hospitals.



Known as the Remington Incremental Sytem, it presents advantages not previously available. Fresh air for cooling is taken through the wall under each window, eliminating the need for installation of ducting and piping to carry the air and circulating water long distances. While the cooling is decentralized to each individual unit of the system, the heating makes use of the central hot water or steam system, the supply and return pipes of that system being connected directly into the recessed units.
More information? Circle Item 48 on postcard, page 101.

Valve Has Four Controls

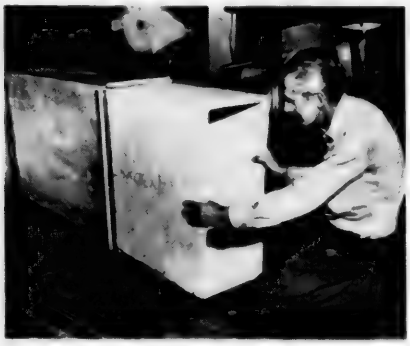
A solenoid valve with independent controls for manual opening, adjustment of flow, and opening and closing speed, has been introduced by J. D. Gould Company, Indianapolis, Ind.

It can be mounted on piping running at any angle. Primarily designed for filling operations, hydraulic systems and elevators, it can be used in a variety of general service applications and is available in all standard sizes from ½ to 2 in. Present maximum capacity is 300 psi.

Four independent controls are grouped in a cluster for convenient adjustment: flow adjustment, closing speed adjustment, opening speed adjustmentt, and manual opening stem. Flow adjustment increases or decreases flow through the valve. Closing and opening adjustments are made independently and positively. Neither adjustment has any effect on the other, as in other type solenoid valves. Manual opening stem allows operation of the valve in case of power failure or emergency.
More information? Circle Item 49 on postcard, page 101.

Pre-Formed Duct Lining

A new duct lining, called Insul-Coustic, which reduces labor costs at the same time that it provides more effective insulation against both heat and sound is announced by Insul-Coustic Corp., Maspeth, N. Y.



The molded fibrous glass liner is pre-formed at the factory to fit rectangular or circular ducts in a variety of sizes and thicknesses in 4-ft lengths. Lightweight, and easy to handle, the liner is quickly inserted into the duct. The interior surface is lined with an open-weave glass cloth that prevents surface erosion and reduces frictional resistance to air flow.

More efficient acoustical insulation results from the high sound-absorption characteristics of the product which absorbs air-borne sound and eliminates duct whistle. It also provides all the thermal insulation advantages of fibrous glass plus features not available in any other liner, and has a k factor of .25 at 75 deg F mean temperature.
More information? Circle Item 50 on postcard, page 101.

New Color For Standard Line

Plans to coat the exteriors of its standard line products a tile gray color, replacing the brown finish which has been standard for a number of years is announced by The Trane Company, La Crosse, Wis. The grey blends with traditional machinery colors for factory installations as well as allowing for greater interior decorating leeway when products are used in the home. If the homeowner wants to paint units another color, the gray serves as a good base.
More information? Circle Item 51 on postcard, page 101.

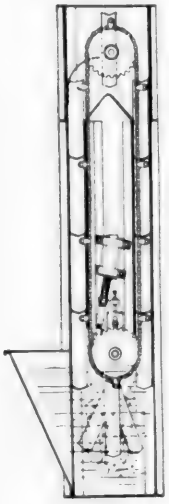
(*Continued on page* 124)

Random Thoughts from a Filter Engineer

by Bruce Carkin, Sales Engineering Department

- **AUTOMATION...IT EVEN FILTERS AIR**
- **LOOK OUT...PRICE TAGS ARE DECEIVING**
- **SUPPOSE AIR COST MONEY?**

AUTOMATION— IT EVEN FILTERS AIR



With the big swing to automation, most everybody looks for push-button equipment that runs itself. You might say our Automaze does just this when it comes to filtering air. Here's what we mean.

With Automaze, all you need to do is start it up. Then you can forget your problem of filtering air. To assure maximum effective filtration, there's a *double* curtain of impingement-type filter panels through which the air must pass.

Another nice thing about Automaze is that it *maintains* its peak efficiency. That's because the adhesive is applied *on a continuous cycle*, unlike the stationary panel-type filter.

Automaze is also completely self-cleaning. All the panels are automatically dipped and agitated with a highly effective "pulse" action in a bath during cleaning and renewing of the adhesive. Maintenance is simple. Once or twice a year a reservoir is drained and cleaned.

Speaking of automation, our Electromaze (electronic air filter) also removes dust particles automatically if extremely fine dust is your problem.

LOOK OUT...PRICE TAGS ARE DECEIVING

Be careful you don't judge a filter by its price tag. Look at the overall cost (that includes operation and maintenance) before you buy. Remember, *all* filters must be serviced regularly—whether they're panel type or electrostatic. And we at Air-Maze make both.

As a case in point, take the Electromaze—our electronic air filter that removes dirt particles down to 1/50 of a micron. The first cost may seem high, but look at the savings in service costs over panel-type filters.

It costs about 60 cents to clean and renew the adhesive on one impingement type panel. This adds up to an $18 bill just to clean a 24,000 cfm job. Consider that you service these panels once a month, you're out $216 a year . . . many times the cost of operating and servicing the Electromaze.

Before you decide on any filter, you'll be money ahead by calling in a consulting engineer—or writing us at Air-Maze.

SUPPOSE AIR COST MONEY?

If we had to pay for air, chances are people would be a whole lot more particular about it. Generally speaking, though, most folks consider the air around us as being "clean". You and I in the air filtration business, of course, know that nothing could be farther from the truth.

As luck would have it the human eye is a notoriously poor judge of cleanliness. Experts tell us the eye can only detect air-borne dirt particles 10 microns and larger. Actually, the air around us is teeming with dirt particles smaller than 10 microns.

But man's inability to see air-borne dirt points up why many a person is led to believe that *any* filter will solve almost *any* air filtration job. Those of us in the business know by experience that every filter must be engineered with extreme care to fit specific requirements—high dirt holding capacity, low pressure drop, air velocity, cost.

This problem of engineering each filter to meet specific needs is one that Air-Maze has been working with since 1925. Regardless of what requirements your installation calls for, we have the right filter to do the job. Why not write us? The Air-Maze Corporation, Cleveland 28, Ohio.

AFI MEMBER AIR FILTER INSTITUTE

AIR-MAZE

The Filter Engineers

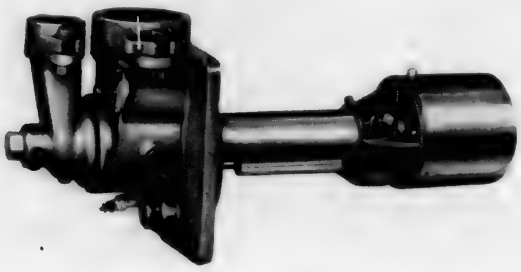
AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

(*Continued from page* 122)

Flame Adjusts To Tube Length

Burners designed to provide control of flame length to fit the length of radiant tubes for better heat distribution are developed by Hauck Mfg. Co., Brooklyn, N. Y.

A primary air adjustment device permits the burner application to a full range of tube sizes. The major portion of combustion air is introduced around the outside of the flame retention nozzle to prolong combustion over a greater length. All of the air for combustion is supplied



through the sealed-in burner, eliminating need for an eductor or exhaust fan. The burner permits a turndown ratio of 5 or 10 to 1.

The burner includes a mounting flange with integral air inlet body, flame length control lever and indicator dial, direct spark ignition, observation port, gas inlet body with primary air mixing adjustment, full flanged gas and air inlets, and the burner nozzle assembly. The nozzle has supporting posts to keep it centered in the radiant or immersion firing tube. Burner may be operated with automatic control of the on-off, high-low or modulating type.

For areas requiring an alternate fuel, a dual fuel burner is available for either light fuel oil or gas. This combination burner offers a self-clean metering valve for precision adjustment of oil flow rate and easily duplicated valve settings. Both types are available in a complete line of burner sizes for tube firing requirements.

More information? Circle Item 52 on postcard, page 101.

Automatic Liquid Level Control

An automatic sensitive gauge, the Auto-Level, which measures, records, if desired, and maintains the level of fluid in tanks, bins, kettles or furnaces, is manufactured by General Glass Equipment Co., Atlantic City, N. J.

Ideal for applications where physical contact with the material being measured is undesirable, the device utilizes changes in differential air pressure to indicate and control the level of the fluid.

In operation, a tube through which a constant air supply flows is lowered near the surface of the fluid being measured. As the level of the fluid rises it creates a restriction to the flow of air and causes a back pressure to occur within the sensing tube. Conversely, as the distance between the sensing tube increases there is a lowering of the back pressure. The variation of the back pressure in the sensing tube is magnified by a differential pressure controller with an amplifying stage. A second tube, installed well above the fluid level, is used to compensate for any change in the ambient pressure. The back pressure is used to control the level of the fluid with a simple on-off system. Proportional or time delay control is also possible.

Advantages claimed include no physical contact with fluid being measured, constant operation as opposed to intermittent, and accurate measurement up to plus or minus 1/32 in.

More information? Circle Item 53 on postcard, page 101.

Hard Rubber Fog Nozzles

A line of hard rubber fog nozzles is announced by Bete Fog Nozzle, Inc., Greenfield, Mass. They are claimed to be corrosion resistant, with practically any spray, and long-wearing.

Because of their immunity to most chemical substances, their use where corrosive conditions make the use of metal impractical and where nozzles of other nonmetallic material such as Teflon are unsuited because of chemical properties, high temperature, or cost, is recommended.

H R series utilize the manufacturer's spiral design and are of one piece, non-clogging construction. They are available in 10 models with narrow angle, 50 deg, or wide angle, 120 deg hollow cone spray pattern in 5 different flow rates from 5 to 50 gpm. The thread connection for the smaller sizes is $\frac{3}{8}$ in. male pipe thread; $\frac{1}{2}$ in. male pipe thread for the larger sizes.

More information? Circle Item 54 on postcard, page 101.

General Purpose Thermostat

A general purpose industrial thermostat, with temperature ranges up to 700 deg F, is available from Industrial Heating Dept., General Electric Co., Schenectady, N. Y.

It is designed for such applications as sterilizers, water and oil heating, metal platens, process ovens, degreasing tanks, melting pots, and compressed air heaters.

Copper bulbs and capillaries are supplied for applications up to 250 deg, and steel bulbs and capillaries for use up to 700 deg. Standard bulb diameters are 3/8 and 3/16 in.; capillary lengths are available up to 180 in.

Switching mechanism of the unit is double-pole, single-throw, snap-action, normally closed or normally open, for a-c operation. Thermostats can also be ordered for d-c operation.

Case styles include both knob and screwdriver adjustment types, depending on temperature range required.

More information? Circle Item 55 on postcard, page 101.

(*Continued on page* 126)

Specify RECO

Rhode Island Hospital, Providence, R. I.
Shepley, Bulfinch, Richardson & Abbott—Architects & Engineers
Merrill Associates—Heating, Ventilating and Air Conditioning Engineers
Elhatton Plumbing & Heating Co.—Plumbing Contractor
W. B. Parsons Co.—RECO Representative, Needham, Mass.

On Call Around the Clock... Hot Water by RECO!

RHODE ISLAND HOSPITAL's new 452 bed Main Building relies on RECO Hot Water Storage Heaters for plenty of hospital-pure hot water. Made of tough, rust-proof copper silicon, these RECO storage heaters were ASME built and tested to *deliver over 10,000 gallons of 180° hot water* per hour, every hour. And RECO guarantees this performance.

Make the RECO guarantee of top quality, fair price and quick delivery a part of your next heating job. SPECIFY RECO.

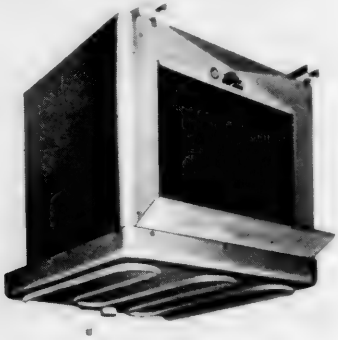
Write today for free catalogs, plus name of RECO representative nearest you to: Dept. L, Richmond Engineering Co., Inc., 7th & Hospital Sts., Richmond, Va.

RICHMOND ENGINEERING CO., INC.

(*Continued from page* 124)

Unit Has Hot Gas Defrost

A Recold ammonia unit with hot gas defrost pan is announced by Refrigeration Engineering, Inc., Los Angeles, Calif.

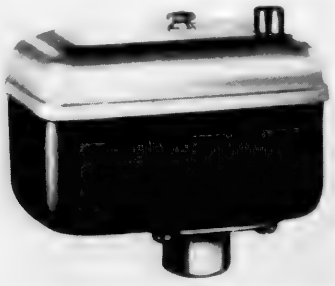


Unit is designed to meet the need for ammonia ceiling units where hot gas defrost is required. With defrost coil on pan, a low temperature ammonia unit is available for either flooded or direct expansion operation. The pan, defrost coil, and cooling coil of steel fins and steel tubes are all hot dipped galvanized after fabrication.

More information? Circle Item 56 on postcard, page 101.

Switch Protects Water Systems

Pump operation stops when water pressure falls below a safe, pre-determined operating level, and pumps and water cooled motors are protected when water level in well drops below intake of drop pipe and operating pressure falls to cut-off point, with the use of a low pressure cut-off switch produced by Furnas Electric Co., Batavia, Ill.



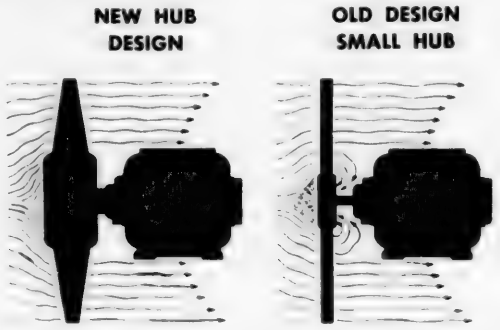
Rated at 1 hp, 110-220 v a-c, and actuated by operating pressure from pump, each switch is pre-set at the factory to cut-out at approximately 5 or 6 psi. Other pressure settings are available. When pressure drops to 5 or 6 psi, contacts will interrupt line voltage to pressure switch, stopping pump operation. Pumping is resumed by depressing reset button, located on switch. Automatic operation will continue as long as there is an adequate water supply to maintain normal operating pressure.

There are two poles to break both lines to the pressure switch in case low pressure cut-off is reached. Metal parts are either in themselves resistant to corrosion or are cadmium plated to resist corrosive action. When used in conjunction with a magnetic starter and pressure switch, it will operate as a pilot control.

More information? Circle Item 57 on postcard, page 101.

Fan Is Wider; Has Large Hub

Diagram shows aerodynamic hub and blade design of Axial Airfoil fans produced by Chicago Blower Corp., Franklin Park, Ill.



Fans are wider than standard designs and have larger blade angles. The latter decrease to small values at the tip. Wide blades make less noise and have higher pressure characteristics than narrow blades. The larger hub size results in the blade near the hub producing a pressure equal to that against which the whole unit is working. This prevents partial stalling or back flow.

Fan wheels are fabricated from die-formed sheet steel parts, or other materials available in sheet form for specific applications. All blades are hollow, airfoil design, die-formed in one piece and welded shut. They are available with 2, 4, 6 and 8 blades, depending on the pressure and volume characteristics desired from the fan.

Eight different fans, designed to handle ventilation, cooling and drying under nearly all industrial conditions are available in a variety of styles and models. All motors furnished with fans are made by nationally-known manufacturers in NEMA frame sizes. Special motors that meet Fire Underwriters' approval can be furnished for explosive atmospheres.

Fan diameters run from 12 to 72 in. and have a certified air moving capacity of 1,200 to 100,000 cfm.

More information? Circle Item 58 on postcard, page 101.

Shallow Well Jet Pumps

Announcement of its Series 4300 Century Deluge shallow well jet pumps and water systems is made by A. Y. McDonald Mfg. Co., Dubuque, Iowa.

Pumps are constructed only of iron and bronze, and are finished in gleaming white. Suction inlet is located at the top to trap priming water in the pump housing for quick starts. The same venturis and nozzles are used as in the company's Fig. 4130SW and Fig. 4150SW convertible pumps. Capacitor motors of ⅓ hp, 115 volts and ½ hp, 115-230 volts are included.

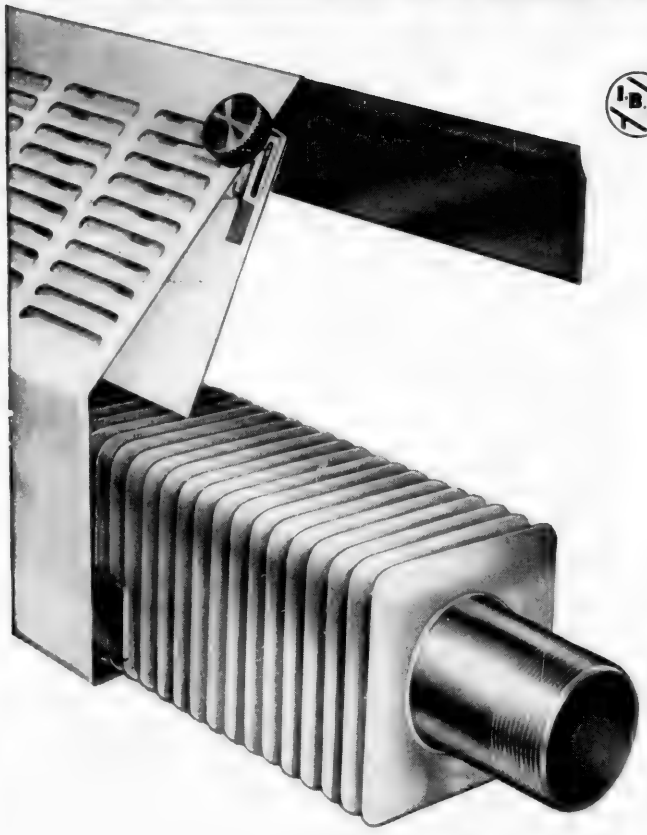
More information? Circle Item 59 on postcard, page 101.

(*Continued on page* 128)

SARCOFIN

When you buy or specify radiation

make sure you get all these advantages!



Sarcofin offers you:

APPROVED RATINGS—as established by Institute of Boiler and Radiator Manufacturers for finned-tube and baseboard radiation.

FULL GUARANTEE—top-quality Sarcofin products, backed up by a *1-year guarantee* against defects in materials and workmanship. Heating elements *guaranteed* for maximum working pressures.

COOPERATION—careful selection of radiation by experienced Sarco and Sarcotherm heating engineers.

UNDIVIDED RESPONSIBILITY—the protection and convenience assured by obtaining from *one* "Complete Line" source...SARCO-SARCOTHERM... not only Sarcofin finned-tube and baseboard radiation but also heating specialties for steam and hot water, condensation and vacuum pumps, temperature regulators, and weather-compensated control systems for steam and hot water heating.

SARCO COMPANY, INC.
SARCOTHERM CONTROLS, INC.
Empire State Building, New York 1, N. Y.

MAIL COUPON FOR THESE BULLETINS

Sarco Company, Inc.—Sarcotherm Controls, Inc.
Empire State Building, New York 1, N. Y.

Please send me:
- ☐ 32 page Bulletin No. 1650 on Sarcofin Finned-Tube Radiation.
- ☐ Bulletin No. 1625 on Sarcofin Baseboard Radiation.
- ☐ Also information on _____

NAME _____

FIRM _____

ADDRESS _____

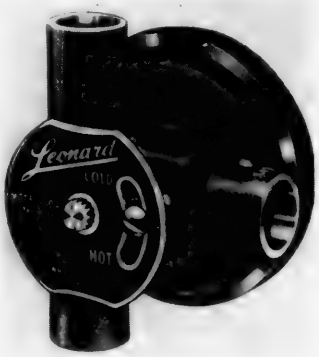
CITY _____ STATE _____

2125-B

(*Continued from page* 126)

Tempering Valve

A new tempering valve, Model 110, designed for direct copper tube installation is introduced by the Leonard Valve Co., Cranston, R. I.



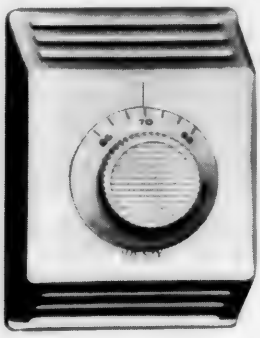
The low-cost unit requires no adapters, and may be sweat-connected without removing the company's thermostatic element. This element is impervious to corrosion, will not puncture or fatigue, and is unharmed by extremes of either hot or cold temperatures.

The unit mixes cold water with high temperature hot water at the heater outlet, tank or tankless, to deliver water at a safe and desirable temperature, adjustable up to 180 deg F. Hot water is conserved, and fuel consumption reduced. Sizes available are: ½ and ¾ in. for sweat connection, and ½ to 2 in. standard pipe thread.

More information? Circle Item 60 on postcard, page 101.

Combined Thermostat, Switch

A combined thermostat and two-pole switch, model DLV, which provides sensitive direct control of electric heating cable, non-automatic heaters, duct heaters and other electric heating units, is manufactured by Wesix Electric Heater Co., San Francisco, Calif. Rated at 25



amps, 240 volts with a range of 55 to 85 deg F, the device is sensitive to a temperature change of plus or minus one deg.

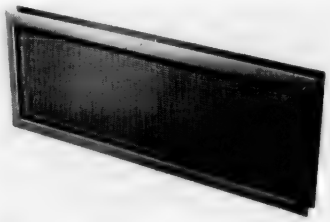
Design incorporates heat feedback to allow the thermostat to properly anticipate the carry-over effect of the rising air temperature. This serves to level off peaks and valleys in room temperature swings by time-cycling power to the heating unit. The heat feedback, by drawing a large quantity of air past the thermal-sensitive elements, allows accurate sampling of air temperature.

Twin bi-metal coils with a combined length of 12 in. provide quick make and break action. The switch built into the thermostat meets National Electrical Code requirements calling for all hot wires to be broken when the switch is in the *off* position. This built-in feature eliminates the expense and inconvenience of a supplementary switch. All electrical connections and actions on the device are isolated on the back where the uncontrolled heat will not affect thermostatic action.

More information? Circle Item 61 on postcard, page 101.

Grille Adjusts To Door Size

For doors from 1⅜ to 2 in. thick, a grille is available with telescoping frame from Barber-Colman Co., Rockford, Ill. The frame provides a 1 in. flange for both sides of the door.



One model has a vision-proof core with a free area of 81.5%. Baked enamel finishes match any color desired. Standard finishes are also available.

More information? Circle Item 62 on postcard, page 101.

Gas Safety Shut Off Valve

A new gas safety shut off valve, the Poly-Trol, designed to protect against dangers of leaking gas resulting from tornadoes, cyclonic winds, bombings, earthquakes, internal explosions, fires and excessive gas pressures is announced by Handley-Brown Heater Co., Jackson, Mich.

Although the multi-purpose valve is a new development, two predecessors have been manufactured by the company for over two years. The company plans to continue manufacturing these standard models which safeguard gas installations in the event of fires and excessive gas pressure. The additional safety features of the new valve are expected to create a general demand for the product, especially in tornado-plagued areas.

The device is installed between the gas service and meter. When the valve senses a dangerous condition, it shuts off the gas and remains shut until reset by a serviceman. The valve is available in ¾, 1, and 2-in. sizes. The company also expects to make them for connections up to 10 in.

More information? Circle Item 63 on postcard, page 101.

(*Continued on page* 130)

GILSULATE® helps another modern school hold costs to $10,000 per classroom

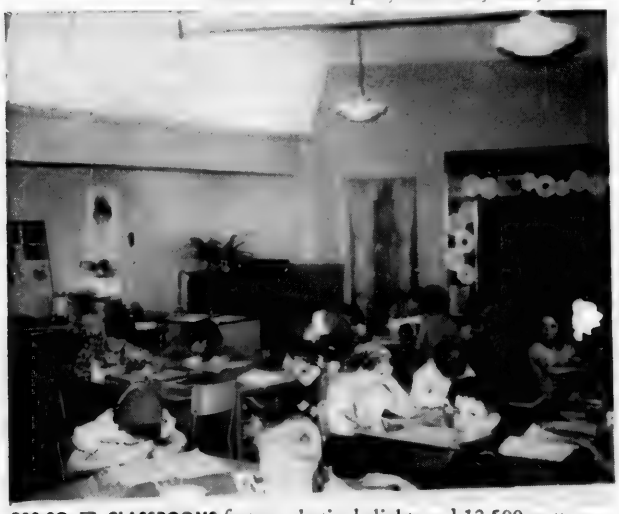
All underground steam lines protected with GILSULATE Insulation System

MODERN WILDER SCHOOL features 6-foot overhang on east and west as weather protection, 5-foot wide walks; each classroom has outside entrance. Exterior is brick veneer and concrete.

Mechanical Contractor: Intermountain Company, Boise, Idaho
General Contractor: L. H. Krieger Construction Company, Nampa, Idaho
Engineer: Kendall M. Wood, Spokane, Washington

"...this type of installation helped keep our costs down."

Harold G. Thompson, Architect, Boise, Idaho.



900-SQ. FT. CLASSROOMS feature plastic skylights and 12-500 watt concentric ring fixtures; continuous wall heating and a mechanical ventilation system. Total building area is 12,416 sq. ft.

Surveys show that most modern classroom construction costs average well over $30,000 per classroom. Yet the Wilder Elementary School in Wilder, Idaho, containing 11 classrooms, an administrative suite, plus separate boiler house, cost only $116,827! GILSULATE insulation was used on all the underground steam supply lines between the central boiler plant and other buildings. This remarkable cost level was also achieved at the Cadott School in Wisconsin—another GILSULATE installation.

The Wilder School installation consists of a 5-inch steam line and a 1¼-inch condensate return running for 156 feet from the boiler house to the school, and a 6-inch line and 1½-inch condensate running for 120 feet between the boiler and high school. The entire job required 17 tons of Type A GILSULATE, and took 21 man hours to install, plus 2 hours for a grader to backfill the trench.

Whatever type of job you have in mind—airport, school, utility, institution, factory, railroad—it will pay you to investigate the unusual features of this easily-installed, dependable, low-cost insulation system. Write for further information or see your local GILSULATE dealer.

FACTS ABOUT GILSULATE

1. EASY TO USE—just pour and tamp... pipe heat does the rest.
2. FORMS 3 ZONES of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. NEEDS NO HOUSING OR MECHANICAL SHEATHS: no mixing, special handling or equipment.
4. ONLY NEEDS NORMAL PIPE SPACING: for multiple pipe or cramped conditions.
5. THREE TYPES AVAILABLE:
   Type A for 220°-300°F. temp. range
   Type B for 300°-385°F. temp. range
   Type C for 385°-520°F. temp. range

THE TRIPLE-ZONE INSULATION SYSTEM FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

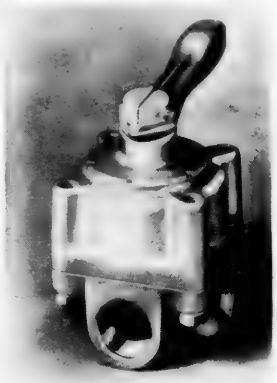
GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California
OFFICES AT: 134-A West Broadway, Salt Lake City, Utah
1145 East Jersey Street, Elizabeth 4, New Jersey
The Agents Bldg., 3537 Lee Rd., Cleveland 20, O.

(*Continued from page* 128)

4-Way Valve

An addition to the company's line of a new 1½-inch. 4-way valve for 0 to 250 psi service is announced by Barksdale Valves, Los Angeles, Calif.



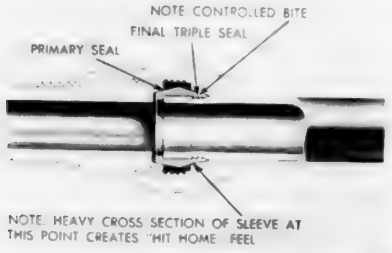
This valve incorporates the company's Shear-Seal principle, which consists essentially of a pressure-balanced, self-aligning tubular sealing ring in constant perfect contact with an optically flat porting disc or rotor containing the flow passage. This sealing principle has proven especially effective where positive shut-off is important. Because flow is through the tubular ring and never across sealing surfaces, and because the square external corner of the ring wipes the rotor clean, no dirt can enter between the sealing surfaces to cause scoring and destroy sealing qualities. With each actuation the seals actually lap themselves to a more perfect seal; the small amount lapped away after years of service is taken up by a back-up spring.

Since corrosion is a major source of air valve trouble. non-corrosive materials are used for all valve parts.

More information? Circle Item 64 on postcard, page 101.

Flareless Tube Fitting

A flareless tube fitting. the Hi-Seal, is introduced by Imperial Brass Mfg. Co.. Chicago. Ill. The fitting makes a foolproof. butt-tight joint and is designed for a full range of pressure conditions.


NOTE CONTROLLED BITE
FINAL TRIPLE SEAL
PRIMARY SEAL
NOTE HEAVY CROSS SECTION OF SLEEVE AT THIS POINT CREATES "HIT HOME" FEEL

Since a butt-joint is formed and there is no tube entry into the body of the fitting, tubing need not be sprung when making assemblies. This feature is advantageous when working with short lengths of tubing and with large-sized. heavy wall or hard-temper steel tubing, all of which are difficult to spring.

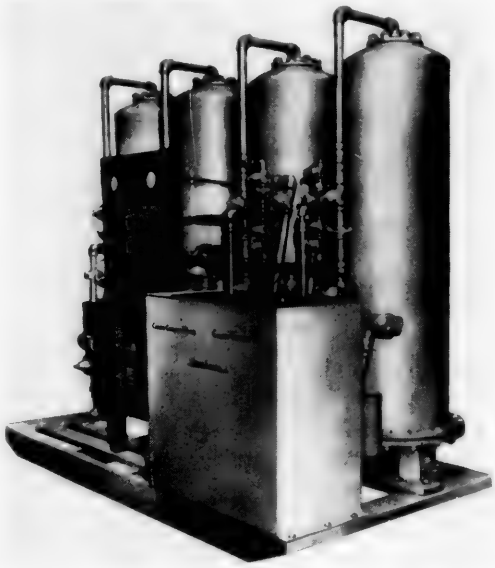
Available in steel or stainless steel in a variety of sizes, the fitting consists of a body. nut and alloy steel sleeve. It is engineered to withstand high pressures, hydraulic surge, vibration and other severe operating conditions. No flaring or threading of tubing is required in making assemblies.

A shoulder on the sleeve prevents incorrect assembly even by inexperienced personnel. Three serrated edges on the sleeve bite radially into the tube surface to a controlled depth, making a triple seal. The fitting permits close tube bends, and may be disconnected and reconnected as often as desired and still maintain a positive seal. It is available in a wide variety of types and shapes in sizes for ⅛ to 1½-in. tubing.

More information? Circle Item 65 on postcard, page 101.

1000 Gph Demineralizer

Multi-column ion exchange principles are applied in the automatic packaged four-column demineralizer developed by Penfield Mfg. Co., Meriden, Conn.



Effective removal of free carbon dioxide and silica is accomplished by passing raw water through cation and anion resins. When the effluent's purity falls below the standard set by the operator, the unit automatically stops delivering treated water and the need for a regeneration cycle is signalled. The regeneraion cycle, including rinsing and readmitting the effluent when the standard of purity is attained, is accomplished with the setting of a switch.

The columns of the unit are rolled steel, butt welded. with plastic effluent lines. Underdrain system consists of perforated stainless steel plate on top of which a plastic screen rests. This system produces excellent distribution results and eliminates the necessity of space consuming distribution media.

Regenerant piping includes non-corrosive eductors. non-corrosive valves, and plastic draw-up lines for both acid and caustic regenerants. Process piping is 150 lb bronze pipe for all raw water lines, and stainless steel or plastic on all effluent lines.

More information? Circle Item 66 on postcard, page 101.

(*Concluded on page* 132)

You can expect
MORE COMFORT PER FUEL DOLLAR
from Modine UNIT HEATERS

Comfort-economy zone

Outlet air temperatures, velocities and volumes are *correctly related* in Modines for maximum comfort at reduced fuel costs. *Exclusive* Modine velocity generator produces penetrating heat throw, cuts through cold air strata near floor . . . improves overall heating efficiency.

Horizontal delivery type, direct pipe-suspended, can be installed as recessed or fully concealed unit.

Modine horizontal unit heaters

Built for steam and hot water service, units are available in blow-through and draw-through types . . . in 36 different capacities.

For drying and processing applications, hot water units with higher fin-to-tube ratios may be operated on steam.

Special Modine HCR high-corrosion-resistance premium models are available where resistance to internal corrosion is a problem.

Vertical delivery type. Light weight unit installs easier without special ceiling supports.

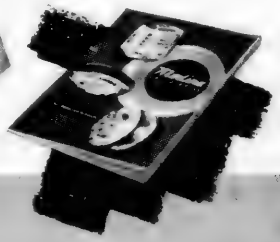
Modine vertical unit heaters

Offered in 26 different models each with choice of 4 types of air deflectors. Compact design permits ceiling mounting above craneways. Optimum fin spacing minimizes condenser clogging, especially where excessive foreign material is present in atmosphere.

SU-1322

Write for free Bulletin 155

Gives you complete unit heater details. Write Modine Mfg. Co., 1511 DeKoven Ave., Racine Wis.



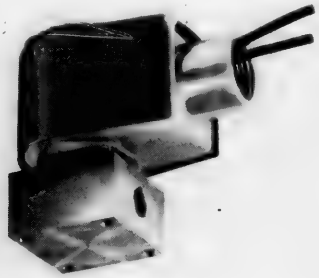
Modine UNIT HEATERS

In Canada: Sarco, Ltd., Toronto

(*Concluded from page* 130)

Carbon Dioxide Shut-off-Valve

A two-way solenoid valve for cooling applications using liquid CO_2 is offered by Automatic Switch Co., Orange, N. J.



These shut-off valves were designed and developed to automatically control the discharge of liquid CO_2. In particular, they are used in low temperature, tumbling barrels, and environmental test chambers where constant temperature control is essential.

Two types are available. Direct injection construction eliminates the need for piping and reduced orifice on the outlet side of the valve. Valve body mounts directly to the inner lining of refrigerated cabinet.

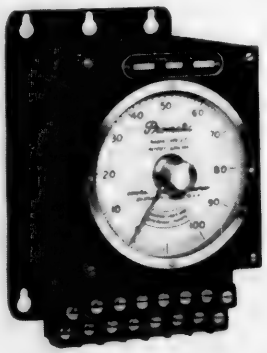
Remote injection valves are provided with ⅛ in. inlet and outlet pipe connections for remote valve location.

Valves have stainless steel, angle type bar stock bodies and teflon discs for tight shut-off on pressures to 1000 psi. Valves mount in any position without affecting operation. NEMA I (pressed steel), NEMA IV (watertight), or NEMA VII, IX and IXA (explosion-proof) solenoid enclosures are available. Continuous duty Class A watertight molded coil, rated 14.6 watts a-c, are standard.

More information? Circle Item 67 on postcard, page 101.

Electronic Timer

Improved design of the Type ET, Electronic Timer is announced by General Control Co., Boston, Mass. First developed in 1942, the timer has been improved to maintain its position as one of the most dependable and accurate timers available in its time range.



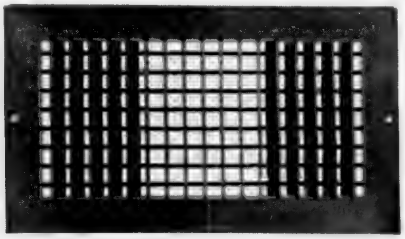
Recent changes include an improved line of matched industrial housings for various mounting conditions. In the case of the boxed, sheet-metal housing, the front of the enclosure has been split to permit access to the terminals for fast wiring changes. Other changes have been the slide-out chassis with plug-in tube and condenser, and a complete up-grading of components which has been made to keep quality and dependability second to none.

The device will control timed operations between 60 milliseconds and 60 seconds, and is adjustable to any fraction of this range. It has readily accessible terminals, isolated load contacts, large, easy-to-read dial, and is available for 115 and 220-volt, 60-cycle operation.

More information? Circle Item 68 on postcard, page 101.

Register in 3 Styles, Any Size

Perfection of its Thermo-Flex air conditioning grille is announced by Midco Register Corp., St. Paul, Minn.



Aerodynamically correct vanes 11/16 in. deep on 2/3 in. centers are pivoted in front to give alignment at any setting. Combination of front and rear vanes gives absolute control of directional flow and throw. Design is enhanced by smooth corners and horizontal and vertical line arrangement.

Registers are produced in 3 styles; vertical front with horizontal rear vanes, horizontal front with vertical rear vanes or single front vanes, vertical or horizontal. Opposed blade dampers are optional on all styles. Produced from 4 x 4 in. to any desired size.

More information? Circle Item 69 on postcard, page 101.

Insulation Is Flexible

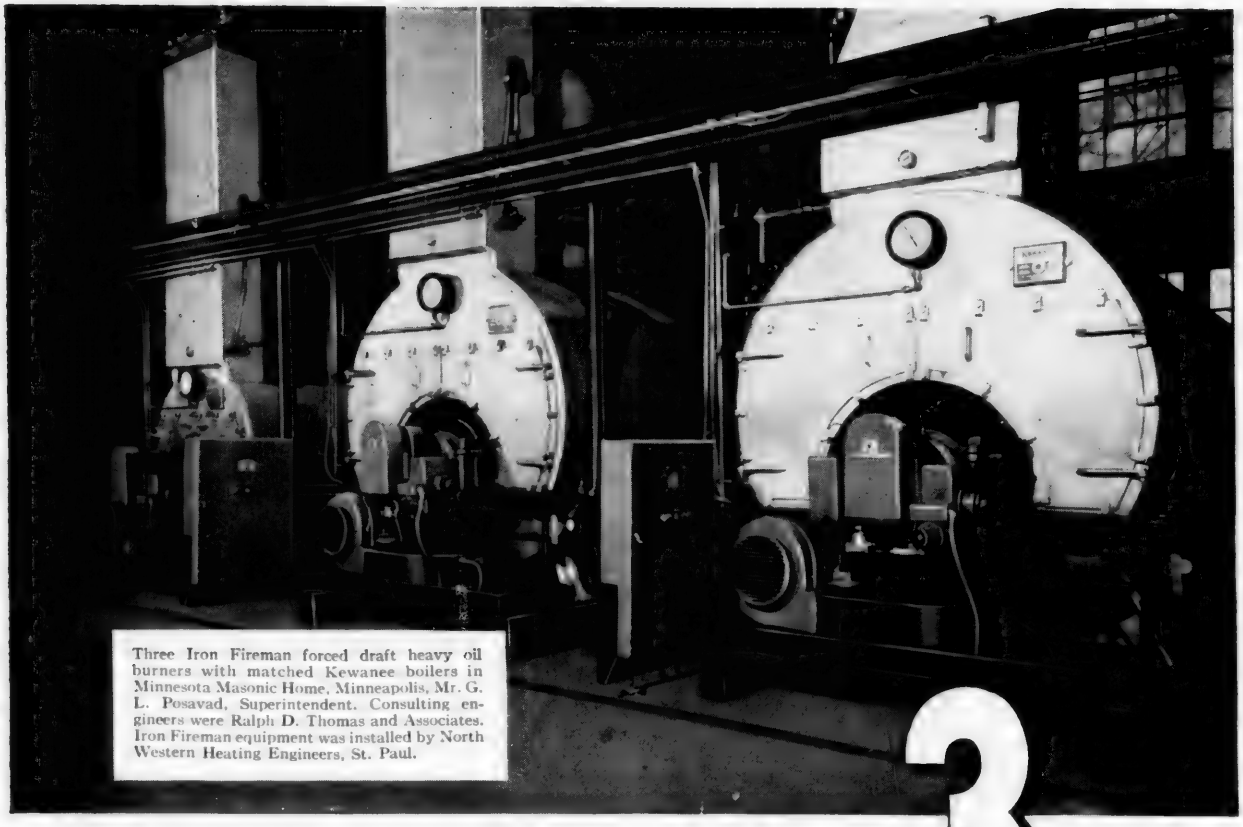
Development of a flexible foamed plastic sheet insulation that adapts itself to curved or irregular surfaces with little or no fitting or cutting is announced by the Armstrong Cork Co., Lancaster, Pa.

Formed from the same basic material as the company's pipe covering, the new sheet form makes it particularly adaptable to insulating large tanks, irregularly shaped vessels, oversize pipes, and refrigeration and air-conditioning equipment.

Material will withstand temperatures as high as 160 deg F, with no limitation at the low end of the temperature scale, since thickness can be built up by applying successive layers. Sheets have a k factor of 0.28 at 75 deg mean temperature and a water vapor permeability of 0.1 perm. They are available in thicknesses of ⅛, ¼, ½ and ¾ in., in sheets 30 x 36 in.

Applied to almost any clean, dry surface with an adhesive supplied by the company, it requires no mechanical support or any other sundry materials. No vapor barrier is necessary, but it is recommended that outside installations be protected by an application of aluminum or asphalt paint.

More information? Circle Item 70 on postcard, page 101.



Three Iron Fireman forced draft heavy oil burners with matched Kewanee boilers in Minnesota Masonic Home, Minneapolis, Mr. G. L. Posavad, Superintendent. Consulting engineers were Ralph D. Thomas and Associates. Iron Fireman equipment was installed by North Western Heating Engineers, St. Paul.

Why it paid to split this steam plant 3 ways

Heating engineer explains why he used three Iron Fireman firing units with matched Scotch boilers in Minnesota Masonic Home

Steam costs were getting out of hand. Should the old steam plant be modernized, or replaced?

After careful analysis of all possible alternatives, a new steam plant was recommended by Mr. A. C. Hunter, president of the engineering firm of Ralph D. Thomas and Associates. This involved replacement of three high pressure HRT boilers, automatic firing equipment, surge tank, feed water heater and all other accessories.

The new plant was designed for low pressure operation, using three boiler-burner units with Iron Fireman forced draft oil burners, in which boilers and burners are engineered as a single integrated unit. Says Mr. Hunter, "Boiler sizes were based on a small unit for summer operation, a large unit for normal winter load, a large unit for standby, and operation of any two for winter peaks." The new plant provides an increase of nearly 70 per cent in rated boiler capacity to take care of future needs for heating, kitchen, water heating and infirmary.

Even with this substantially larger plant, Mr. Hunter's studies showed that the savings in fuel, maintenance and operating costs will return the entire investment in 7 years.

IRON FIREMAN FORCED DRAFT BURNERS

Each Iron Fireman firing unit is a complete combustion system, consisting of burner, forced draft air supply, fuel system and control panel. All elements are assembled, wired and tested at the factory and mounted on a single base ready to attach to the boiler front. The unit can be installed with a matched Titusville or Kewanee Scotch boiler designed specifically for this burner, or in any other type of boiler.

FOR GAS, OIL OR GAS-OIL COMBINATION

The Iron Fireman forced draft burner is available for either oil or gas, or in a dual-fuel combination unit in which fuels can be shifted instantly with no break in operation. Any grade of oil can be used, from lightest to heaviest, without special adjustment. Fires natural gas (high or low pressure), manufactured, mixed, or bottled gas. Firing unit adaptable to any type of boiler.

Send coupon for further information.

IRON FIREMAN®

Automatic Firing Equipment for Heating, Processing and Power

IRON FIREMAN MANUFACTURING CO.
3040 W. 106th Street, Cleveland, Ohio.
(In Canada, address 80 Ward St., Toronto, Ontario.)

Please send technical information and specifications on Iron Fireman Forced Draft firing systems.

Name_____

Firm_____

Address_____

City_____ State_____

NEWS OF THE MONTH

RESEARCH PROGRAM

on aluminum-surface insulation sparks promotional campaign directed to centrally air conditioned homes.

The national trend toward centrally air conditioned homes was given impetus by research findings which reveal that aluminum-surface insulation promotes year-round living comfort at low cost.

• **RESEARCH PROJECTS**—This development is based on the outcome of two independent research projects sponsored by Aluminum Company of America, one at National Bureau of Standards, the other at Pennsylvania State University.

At the National Bureau of Standards, research was carried out to determine the insulating values of aluminum-clad insulation in combination with other insulating products. This project was directed by Henry B. Robinson, assistant chief of the Heating and Ventilating Section; participating as a research associate was Dr. Lee A. Cosgrove of Alcoa Research Laboratories.

Two nationally recognized authorities on thermal properties of materials collaborated on the insulation project at Pennsylvania State University. They are Professor E. R. Queer, director of the department of engineering research, and F. A. Joy, professor of engineering. Tests were conducted in the university's Climatometer, a large chamber in which almost any condition of atmospheric temperature and humidity can be created.

• **FINDINGS EVALUATED**— From these investigations, *U* values for a wide variety of house walls and roofs employing combinations of aluminum-surface insulations have been determined. It is also possible, from the results, to calculate the insulating values of reflective surfaces, either alone or in combination with mass insulation, when facing an open attic area.

Alcoa interprets the findings to indicate that the proper use of adequate amounts of aluminum-clad insulation best overcomes two main obstacles to central air conditioning: high equipment costs and high operating expenses. In most cases, both objections are due largely to inadequate insulation against summer heat, particularly solar radiation.

• **PROMOTIONAL CAMPAIGN**—By applying the research findings, their engineers found that heating and cooling costs for the average sized house (1200 sq ft) may be as low as twelve dollars per month providing the house is properly engineered and adequately insulated. In other words, use of aluminum-surface insulation makes central air conditioning feasible for modest income families.

A promotional campaign has been started by Alcoa to bring this story to the nation's builders and consumers. A Builder's Clinic show, produced by Max Richard and staffed by Broadway actors, is appearing in key cities across the country to demonstrate graphically the heating and cooling economies possible with aluminum-surface insulation. This will be followed by advertising in consumer magazines, business papers, direct mail campaigns, and television.

CLIMATE CENTER COMMITTEE MEETS

The technical committee of Purdue University's new Center for Research on Air Conditioning, Refrigeration and Climate Control (see p. 148, Nov. ACH&V) meets in Purdue's Goss Library. From left to right: Prof. W. E. Fontaine, engineering technical director of the center; Dean of Engineering George A. Hawkins; Head of the School of Mechanical Engineering 2nd committee chairman Harry Solberg; Dr. N. J. Volk, associate director of the University's Agricultural Experiment Station; and Dr. George A. Spencer, Head of the School of Agricultural Engineering. The sixth member of the committee, Dr. Fred N. Andrews, agricultural technical director of the Center, is not shown.

VAST COOLING MARKET

revealed in a nationwide survey of metropolitan homeowners' desire for central cooling systems.

An immediate market for at least 270,000 central air conditioning systems exists among metropolitan home owners, according to a nationwide market survey conducted for Kinetic Chemicals Div., E. I. du Pont de Nemours & Co. That figure is more than 100% of the estimated 250,000 current owners of centrally installed cooling equipment, and represents a potential quarter billion dollar market.

• **EDUCATIONAL CAMPAIGN NEEDED**—Based on a widely scattered sampling of 1,671 home owners, the survey shows a still greater potential if more aggressive marketing techniques are employed. Of those without central cooling now, 93% said they were never contacted by an air conditioning salesman, and 64% had no idea of installation or operating costs, though the same number were convinced that central units could be installed without major changes.

• **NATURE OF MARKET INDICATED**—Of those whose homes are now centrally air conditioned, 86% are completely satisfied, 90% of the units having been installed in the last three years, and 48% having been so equipped prior to occupancy by the present owner; 84% have annual incomes of $7,000 or more, 68% have homes valued at $20,000 or more, while 70% of the homes are custom-built, as opposed to development homes, and 91% are heated with forced warm air.

(News of the Month continued on page 136)

Hanover Acres Housing Project, Allentown, Pa.

42 acres . . . 37 buildings . . . 322 dwelling units. Served by 35 Sarcotherm Weather-Compensated Control systems for hot water heating.

Architect and Heating Engineer: George E. Yundt, Allentown, Pa.
Heating Contractor: Corbit's, Inc., Reading, Pa.

42 acres of comfortable heating ...for 16 years!

Provided by 35 Sarcotherm Weather-Compensated Control Systems

Here's the Test...35 Sarcotherm Systems...16 years on the job...serving 322 dwelling units at Hanover Acres Housing Project, Allentown, Pa. That's a tough test of heating control dependability and economy!

And here's the Result!...The Housing Authority of the City of Allentown reports...throughout the entire 16 years these Sarcotherm Weather-Compensated Control Systems for hot water heating have given trouble-free service and provided money-saving, comfortable heating.

Dependability-plus...that's one of the major reasons Sarcotherm Systems have been installed in many important projects including Hanover Acres and Beardsley Terrace Housing, Bridgeport, Connecticut.

For undivided responsibility on your installations, specify and order from one "Complete Line" source...SARCO-SARCOTHERM.

Write for catalogs. Sarcotherm Controls, Inc., Empire State Building, New York 1, N. Y.

ADVANTAGES OF SARCOTHERM SYSTEMS

On-the-job help—Sarcotherm engineers cooperate in preparing working drawings and wiring diagrams for each job. Also assist in supervising the installation.

Easy to maintain—simple, trouble-free design, fewer parts.

Easy to adjust—to any desired setting.

Complete Control Systems from Sarcotherm include all accessories such as control panels, thermostats, radiator valves, balancing fittings, steam traps, domestic hot water controls, etc.

4008-B

Sarcotherm

AN AFFILIATE OF SARCO CO., INC.

Weather-Compensated control systems for steam, hot water and radiant heating

ACMA ADOPTS STANDARDS

and test codes for air moving and air conditioning equipment; scale model tests explained.

Standards and test codes for air moving and conditioning equipment have been adopted by Air Moving and Conditioning Association (AMCA), recently formed trade association of the industry.

The association was formed early this year by merger of Industrial Unit Heater Association, National Association of Fan Manufacturers, and Power Fan Manufacturers Association. Headquarters are at 2159 Guardian Building, Detroit 26, Mich.

• **SCOPE**—At its annual meeting, the Association approved standards which cover centrifugal, axial, and propeller fans; steam and hot water unit heaters; dehumidifying air washers; central station air conditioning units; power roof ventilators; and residential (attic, window, etc.) type fans. Included in the standards are terms, definitions, operating limits, standard sizes, installation recommendations, specifications, etc.

In so far as possible, the new standards conform with standards and codes previously published and accepted by industry. For example, the standard test code for centrifugal and axial fans adopted by the Association is identical with that sponsored by ASHAE and the National Association of Fan Manufacturers. It includes data on definitions, testing instruments, determinations, observations and calculations, symbols and formulas, and descriptions of various test set-ups.

Similar information is included in other test codes adopted for equipment such as steam and hot water unit heaters; and forced circulation of air cooling and air heating coils.

• **LARGE FAN TESTS**—Much additional information for testing prototypes of extremely large size fans by means of scale models has been added to the standards. This method has the advantage of eliminating the need for building full scale models of large equipment which can be expensive and impractical.

AMERICAN BLOWER

celebrates 75th anniversary. Founder produced exhaust fans for lumber mills in 30x60 building in 1881.

American Blower Company, a division of American Radiator and Standard Sanitary Corporation, passes the three quarter century mark this year. With three plants and over 2300 employees, it produces fans, air conditioning and refrigeration equipment, fluid drives for industrial machinery, unit heaters, and dust collectors for the American and overseas market.

• **STARTED WITH TWO MACHINES**—The first factory in Detroit had three men working on a drill press and a grinding wheel. Early products were the Smith ventilating fan, Dixie blower, and hot blast apparatus. In 1908 American Blower merged with Sirocco Engineering Company, thereby acquiring patent rights to the superior Sirocco fan design.

Merger of American-Standard and American Blower was engineered by Chairman Clarence Mott Woolley of the former and President James Inglis of the latter orgainzation in 1928.

• **LARGEST PLANT IN DEARBORN**—Besides the main offices and its largest plant at Dearborn, Mich., the company maintains a plant at Columbus, Ohio, and San Leandro, Calif. President is J. C. Linsenmeyer; H. E. Barth and E. W. Legier are vice-presidents; E. W. Petersen, vice-president in charge of sales; John Brennon, vice-president in charge of engineering; and C. C. Fuller, vice-president and treasurer.

CENTRAL SYSTEM

supplies 172 apartments in 43 buildings in Dallas, Tex., with heating and cooling.

What is believed to be the first installation of its kind in the United States, an air conditioning central system serving 172 apartments in 43 separate buildings, is proving successful at the Claremount apartments in Dallas, Texas. Each of the four apartments to a building is fully air conditioned, summer and winter, with individual controls in every room.

(Continued on page 156)

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF "AIR CONDITIONING, HEATING AND VENTILATING" published monthly at East Stroudsburg, Pennsylvania for October 1, 1956.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, The Industrial Press, 93 Worth Street, New York 13, N. Y.
Editor, Clifford Strock, 93 Worth Street, New York 13, N. Y.
Managing editor, None.

Business managers: Robert B. Luchars, Edgar A. Becker, and Harold L. Gray, 93 Worth Street, New York 13, N. Y.

2. The owner is:
The Industrial Press, 93 Worth St., New York 13, N. Y.; Robert B. Luchars, 93 Worth St., New York 13, N. Y.; Edgar A. Becker, 93 Worth St., New York 13, N. Y.; Franklin D. Jones, 93 Worth St., New York 13, N. Y.; Walter E. Robinson, 93 Worth St., New York 13, N. Y.; Charles O. Herb, 93 Worth St., New York 13, N. Y.; Harold L. Gray, 93 Worth St., New York 13, N. Y.; Clifford Strock, 93 Worth St., New York 13, N. Y.; Suno E. Larson, 93 Worth St., New York 13, N. Y.; Helena E. Oberg, 65 - 82nd St., Brooklyn 9, N. Y.; Edgar L. Becker, Nominee for Nancy Jane Becker, Susan Louise Becker and Donald Louis Becker, 714 Wellington Rd., Ridgewood, N. J.; First National Bank of Montclair and R. B. Luchars, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; First National Bank of Montclair and Leigh Roy Urban, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; First National Bank or Montclair and Kenneth D. Ketchum, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; David D. Ketchum, 38 Mill Road, Falmouth, Mass.; Lee W. Noyes, Guardian for Susan Yarnall Urban, Greensboro, Vt.; Lee W. Noyes, Trustee U/W of Robert L. Urban, Greensboro, Vt.; John T. Urban, 8 Craigie Circle, Cambridge 38, Mass.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are:
Charlotte B. Baldwin, 420 Clinton Ave., Brooklyn, N. Y.; Franklin D. Jones, 93 Worth St., New York 13, N. Y.; Robert B. Luchars, 93 Worth St., New York 13, N. Y.; Ann Pelletier, 140 Cabrini Blvd., New York 33, N. Y.; Elizabeth Y. Urban, 38 Lakeview Road, Asheville, N. C.; Helen L. Ketchum, 231 King Street, Cohasset, Mass.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt.; Henry V. Oberg, 6825 Almansa St., Coral Gables, Fla.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

EDGAR A. BECKER, Business Manager
Sworn to and subscribed before me this 28th day of September, 1956.
ALEXANDER LOYKA
Notary Public, State of New York, No. 31-7611350. Qualified in Queens County. Commission expires March 30, 1958.

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Hide It...
Combine It...

Installed as a continuous strip in window head or sill (as above), AGITAIR STRIPLINE is the only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill.

AGITAIR® STRIPLINE DIFFUSERS

BLEND IT . . . specify AGITAIR STRIPLINE as a continuous decorative unit, or in sections to meet any requirements of interior treatment.

HIDE IT . . . in shallow lighting coves for perfect concealment.

COMBINE IT . . . with unit or continuous lighting fixtures.

AND REMEMBER . . . no matter how you use it — AGITAIR STRIPLINE diffusing vanes create maximum mixing and aspiration . . . quick temperature equalization . . . and correct air distribution over any desired length.

Every Inch a Diffuser . . . the Vanes Make the Difference

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

DEGREE-DAYS FOR OCTOBER, 1956

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

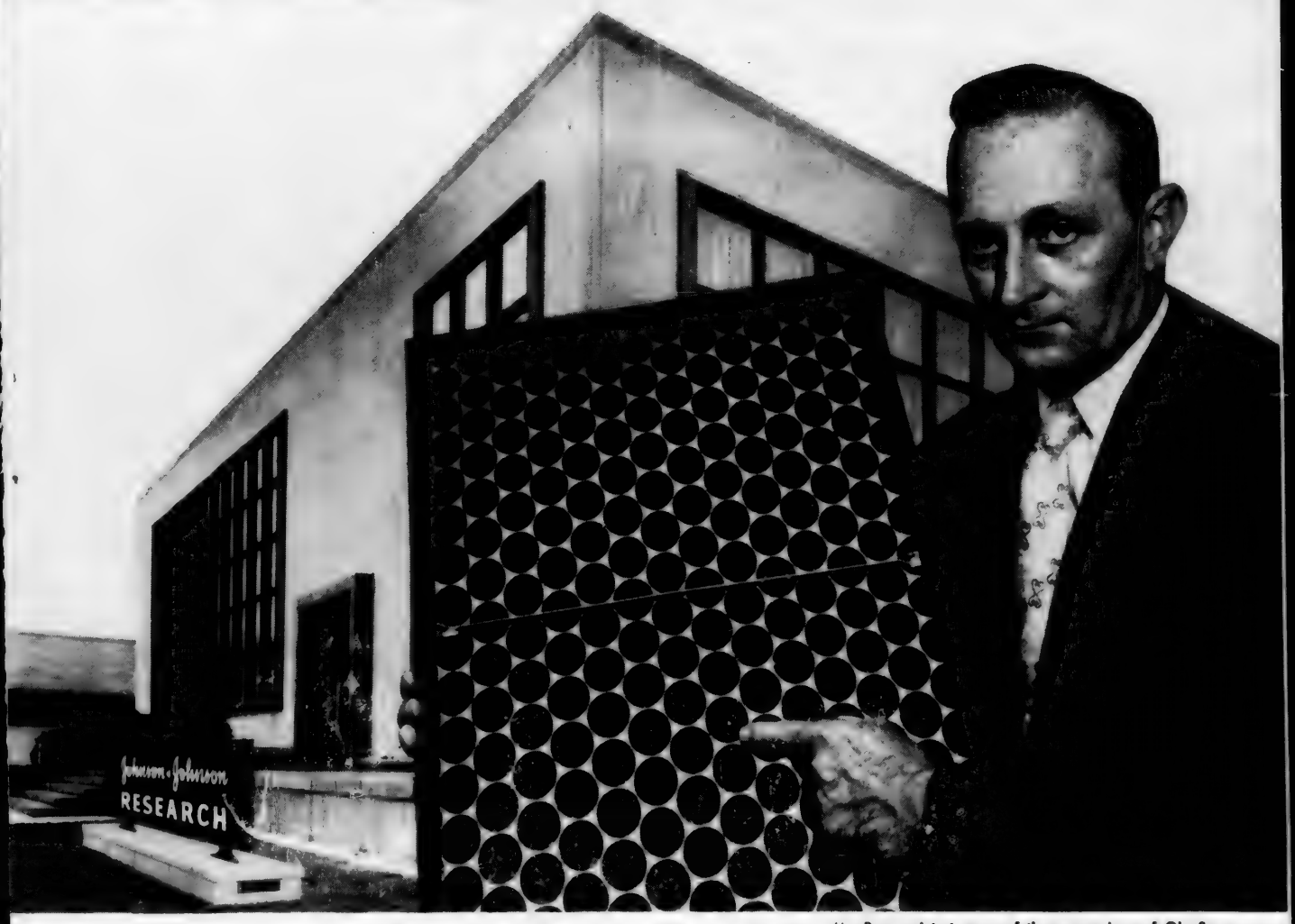
AIR CONDITIONING, HEATING AND VENTILATING'S 29th Year of Publication of Monthly Degree-Day Data

City	October			Season to October 31, incl.*		
	1956	1955	Normal	1956	1955	Normal
Abilene, Texas (A)	36	76	98	36	86	153
Albany, New York (A)	464	387	443	726	561	582
Albuquerque, New Mexico (A)	195	137	630	195	138	228
Alpena, Michigan (C)	422	431	530	776	648	745
Anaconda, Montana (C)	647	527	647**	871	890	982**
Asheville, North Carolina (C)	197	272	262	279	283	312
Atlanta, Georgia (A)	49	138	110	54	138	118
Atlantic City, New Jersey (C)	183	157	230	253	182	259
Augusta, Georgia (A)	41	138	59	59	138	59
Baltimore, Maryland (C)	128	167	207	188	191	236
Billings, Montana (A)	425	368	497	565	607	691
Binghamton, New York (C)	388	327	428	611	475	569
Birmingham, Alabama (A)	62	185	123	64	185	136
Bismarck, North Dakota (A)	485	501	598	772	753	825
Block Island, Rhode Island (A)	306	261	330	431	335	418
Boise, Idaho (A)	453	363	389	548	555	524
Boston, Massachusetts (A)	330	307	315	504	392	392
Bozeman, Montana (C)	589	529	651**	784	867	987**
Buffalo, New York (A)	(a)	337	433	(a)	474	555
Burlington, Iowa (A)	137	339	765	220	395	419
Burlington, Vermont (A)	480	435	521	778	664	693
Butte, Montana (C)	664	601	655**	924	961	999**
Cairo, Illinois (C)	50	186	161	55	186	189
Charleston, South Carolina (C)	13	42	34	16	42	34
Charlotte, North Carolina (A)	87	155	147	133	156	154
Chattanooga, Tennessee (A)	96	230	169	111	230	193
Cheyenne, Wyoming (A)	445	470	577	581	691	818
Chicago, Illinois (C)	140	264	326**	212	298	402**
Cincinnati, Ohio (C)	93	205	222	143	212	264
Cleveland, Ohio (A)	198	320	340	357	372	415
Columbia, Missouri (A)	81	239	262	112	270	324
Columbia, South Carolina (A)	45	131	76	68	131	76
Columbus, Ohio (C)	153	294	299	247	321	358
Concord, New Hampshire (A)	532	502	527	855	712	719
Concordia, Kansas (C)	128	240	277	169	296	332
Dallas, Texas (A)	14	54	53	14	54	53
Dayton, Ohio (A)	171	315	324	277	344	397
Deer Lodge, Montana (C)	682	596	733**	1012	990	1132**
Denver, Colorado (A)	277	336	425	345	462	545
Des Moines, Iowa (A)	162	347	355	265	417	454
Detroit, Michigan (A)	240	304	381	412	384	477
Devils Lake, North Dakota (C)	541	591	654	914	916	930
Dodge City, Kansas (A)	128	190	262	144	253	302
Dubuque, Iowa (A)	239	425	444	412	529	593
Duluth, Minnesota (C)	493	610	614	908	891	891
Elkins, West Virginia (A)	302	414	412	491	485	534
El Paso, Texas (A)	65	34	70	65	34	70
Ely, Nevada (A)	637	542	561	796	805	789
Escanaba, Michigan (C)	422	461	555	767	681	802
Evansville, Indiana (A)	121	258	215	176	266	274
Fargo, North Dakota (A)	405	534	586	696	765	801
Fort Smith, Arkansas (A)	42	145	131	42	145	140
Fort Wayne, Indiana (A)	222	334	377	363	398	484
Fort Worth, Texas (A)	21	55	58	21	55	58
Fresno, California (A)	135	53	86	135	54	86
Galveston, Texas (C)	0	4	0	0	4	0
Grand Junction, Colorado (A)	281	279	333	289	312	369
Grand Rapids, Michigan (A)	289	344	462	486	486	606
Green Bay, Wisconsin (A)	367	462	515	667	661	698
Greensboro, North Carolina (A)	172	230	202	247	242	231
Greenville, South Carolina (A)	113	162	131	156	163	141
Harrisburg, Pennsylvania (A)	295	257	308	441	324	377
Hartford, Connecticut (A)	468	316	384	735	436	485
Hatteras, North Carolina (C)	7	49	63	9	49	63
Havre, Montana (C)	538	498	564	748	325	834
Helena, Montana (A)	508	532	617	724	862	937
Houston, Texas (C)	0	12	0	0	12	0
Huron, South Dakota (A)	345	448	472	531	617	621
Indianapolis, Indiana (A)	143	322	306	247	351	385
Jackson, Mississippi (A)	30	135	69	30	135	69
Kansas City, Missouri (A)	63	182	240	80	200	284
Knoxville, Tennessee (A)	75	221	179	106	221	212
La Crosse, Wisconsin (A)	239	410	447	426	528	599
Lander, Wyoming (A)	486	467	632	617	696	876

(a) Data not available.
*Heating season cumulative, from Sept. 1.
**Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company. Tacoma figures through the courtesy of the Tacoma News Tribune.

[Table concluded on page 140]



Mr. Bors points to one of the many sizes of Glasfloss Filters used at Johnson and Johnson's research center and other plants and offices in New Brunswick, N.J.

"We like the high efficiency and easy handling of Glasfloss Air Filters"

says Mr. Alexander Bors, Maintenance Supervisor at Johnson & Johnson

In the plant offices of Johnson & Johnson, New Brunswick, New Jersey, employees enjoy exceptionally clean, decontaminated air at minimum costs to the company.

Plant personnel state that the highly efficient filtering action and handling ease of Glasfloss Air Filters have made such results possible. Mr. Charles Sutton, field and maintenance engineer, puts it this way. "After three years of Glasfloss, we are convinced that we have obtained the optimum of filter efficiency and ease of handling . . . more than 90% of the contamination is removed by Glasfloss units . . . an obvious improvement over previously used spun glass filters."

Such results have led the company personnel into planning Glasfloss Filtering for a new surgical dressings research and manufacturing plant now under construction.

What's different about Glasfloss that makes such filtering efficiency possible? First, Glasfloss uses only extremely fine, silky glass fibers that are kind to hands and skin. Lighter-to-heavier density of media from front to back stops surface loading, dust and dirt builds up from the inside out. To you, this means Glasfloss catches more dust and dirt, doesn't hamper the flow of cooled or heated air, lowers maintenance costs. Write for complete information on Glasfloss Filters now, ask for Bulletin DF3. Address your request to Glasfloss Dept., Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania.

Over 800 tons of refrigeration supply cold water to 20 individual unit conditioners. All fresh and re-circulated air is filtered by Glasfloss in these units at the total rate of 320,000 cfm.

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PITTSBURGH PLATE GLASS COMPANY

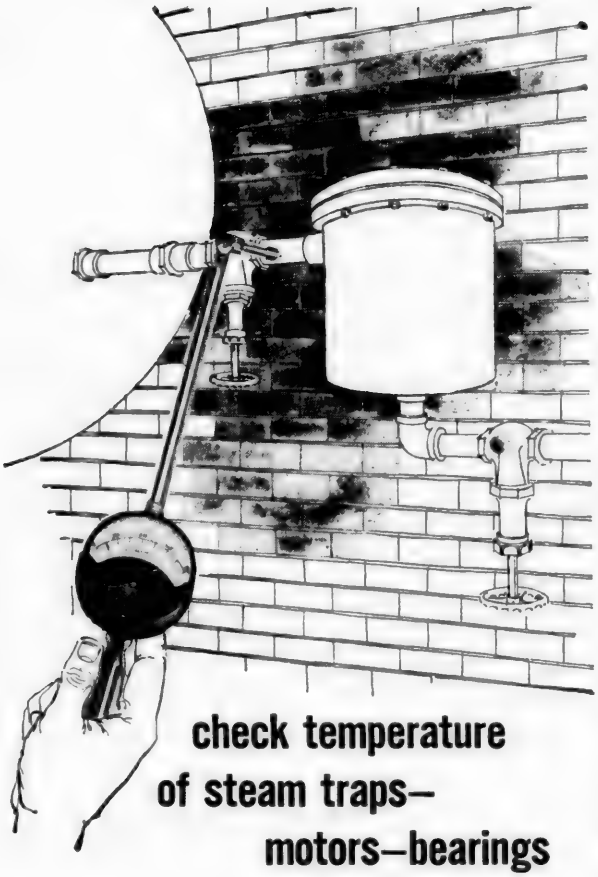
Degree-Days for October, 1956 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 29th Year of Publication of Monthly Degree-Day Data

City	October			Season to October 31, incl.*		
	1956	1955	Normal	1956	1955	Normal
Lewiston, Maine (O)	538	477	501	830	676	666
Lincoln, Nebraska (C)	145	269	310	198	332	389
Little Rock, Arkansas (A)	33	124	110	33	124	120
Livingston, Montana (C)	546	378	523**	717	682	750**
Los Angeles, California (C)	34	58	41	34	64	58
Louisville, Kentucky (A)	131	230	232	194	234	283
Lynchburg, Virginia (A)	216	243	236	308	264	285
Macon, Georgia (A)	23	114	63	28	115	63
Madison, Wisconsin (A)	285	404	419	418	513	556
Marquette, Michigan (C)	363	476	543	725	736	779
Memphis, Tennessee (A)	48	158	126	48	158	143
Meridian, Mississippi (A)	39	150	90	39	150	90
Milwaukee, Wisconsin (A)	287	373	428	475	477	562
Minneapolis, Minnesota (A)	271	423	459	473	559	616
Modine, Illinois (A)	189	356	363	298	427	459
Montgomery, Alabama (A)	26	132	69	26	132	69
Nashville, Tennessee (A)	73	214	154	83	214	176
New Haven, Connecticut (A)	363	285	363	528	383	456
New Orleans, Louisiana (C)	0	14	5	0	14	5
New York, New York (C)	216	182	263	318	212	302
Newark, New Jersey (A)	244	204	301	361	249	348
Norfolk, Virginia (A)	69	122	152	90	122	161
North Platte, Nebraska (A)	315	437	425	435	589	545
Oak Ridge, Tennessee (C)	69	267	225	89	267	225
Oakland, California (A)	208	169	157	244	285	233
Oklahoma City, Oklahoma (A)	72	151	149	72	156	161
Omaha, Nebraska (A)	161	305	331	239	370	419
Parkersburg, West Virginia (C)	159	274	272	269	286	328
Peoria, Illinois (A)	129	331	339	203	372	425
Philadelphia, Pennsylvania (C)	177	156	219	250	172	252
Phoenix, Arizona (A)	47	1	13	47	1	13
Pittsburgh, Pennsylvania (C)	183	275	298	310	305	354
Pittsfield, Massachusetts (A)	499	473	543	826	715	756
Pocatello, Idaho (A)	550	472	487	688	692	670
Portland, Maine (A)	519	501	515	826	747	714
Portland, Oregon (C)	346	282	280	410	388	365
Providence, Rhode Island (A)	394	326	381	588	442	488
Pueblo, Colorado (A)	251	259	383	270	339	457
Raleigh, North Carolina (A)	129	191	118	187	196	128
Rapid City, South Dakota (A)	364	415	500	483	599	693
Reading, Pennsylvania (C)	243	213	285	370	269	342
Red Bluff, California (A)	137	47	59	137	50	59
Reno, Nevada (A)	528	437	443	644	636	608
Richmond, Virginia (A)	146	186	210	221	195	243
Rochester, New York (A)	342	357	440	581	525	573
Roswell, New Mexico (A)	107	134	156	107	134	164
Sacramento, California (C)	123	49	75	123	56	92
St. Joseph, Missouri (A)	115	270	233	151	304	282
St. Louis, Missouri (C)	68	215	202	85	218	240
Salt Lake City, Utah (A)	399	374	381	457	494	469
San Antonio, Texas (A)	3	28	25	3	28	25
San Diego, California (A)	35	54	52	35	55	76
Sandusky, Ohio (C)	179	290	327	315	326	393
San Francisco, California (C)	169	176	128	260	357	238
Sault Ste. Marie, Michigan (A)	490	517	639	913	851	937
Savannah, Georgia (A)	20	87	38	28	87	38
Scranton, Pennsylvania (A)	394	340	389	635	473	504
Seattle, Washington (C)	379	366	329	526	537	463
Sheridan, Wyoming (A)	483	432	578	642	676	817
Shreveport, Louisiana (A)	23	79	53	23	79	53
Sioux City, Iowa (A)	197	340	405	311	437	533
Spokane, Washington (A)	572	549	508	721	787	713
Springfield, Illinois (A)	116	310	259	181	345	315
Springfield, Missouri (A)	85	249	249	108	253	310
Syracuse, New York (A)	373	341	396	598	482	513
Tacoma, Washington (C)	401	371	375	556	555	552
Toledo, Ohio (A)	256	347	387	446	439	489
Topeka, Kansas (C)	80	207	242	105	235	284
Trenton, New Jersey (C)	240	207	285	363	259	340
Tulsa, Oklahoma (A)	(a)	129	152	(a)	129	170
Utica, New York (O)	365	370	430**	601	513	612**
Valentine, Nebraska (A)	352	430	461	490	586	606
Walla Walla, Washington (C)	382	318	308	434	444	401
Washington, D. C. (C)	158	169	231	237	182	263
Wichita, Kansas (A)	81	198	219	93	215	251
Williston, North Dakota (C)	537	518	605	801	797	866
Winnemucca, Nevada (A)	559	476	508	709	720	688
Yakima, Washington (A)	511	483	446	642	684	596

For footnotes, see page 138.



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. . . quickly and accurately with the Alnor Pyrocon, the portable contact pyrometer for taking surface temperatures. This handy, portable instrument can be your most useful maintenance and installation tool . . . it provides accurate temperature readings instantly of any surface (metallic or non-metallic), flat, curved, stationary or revolving.

It's a well-balanced instrument mounted in a sturdy case for protection against the usual hazards of on-the-job service. Jeweled movement is also heavy-duty, shock-resistant type that will withstand hard and continuous use . . . performing with laboratory accuracy.

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Illinois Testing Laboratories, Inc., Rm. 514
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Whatever your ventilating needs, be sure to see how Allen equipment can meet your requirements efficiently and economically.

NEW "I-LINE" for EYE APPEAL

The new "I-Line" provides an attractive low contour, assuring maximum capacity or efficiency with the minimum over-all height.

POWERFUL "VD" for HIGH VELOCITY

By moving a large volume of air at high velocity, this Vertical Discharge fan keeps fumes from sifting back into building.

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. . . is prepared to investigate ventilating problems and plan systems for the efficient removal of heat, fumes, vapor or dust.

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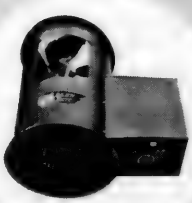
Remote drive Staxauster is designed to handle corrosive fumes, and/or high temperature air.



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Write today for catalog that gives specifications and performance data on these and other units in the Allen ventilator line.

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ROCHESTER, MICH.

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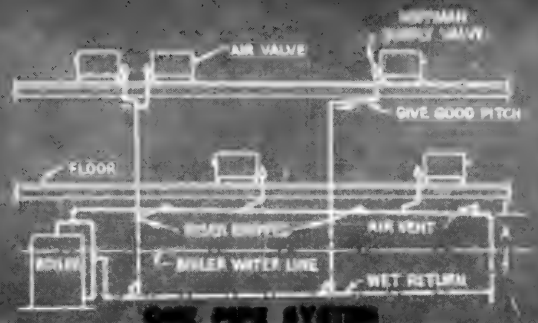
REPRESENTATIVES IN PRINCIPAL CITIES

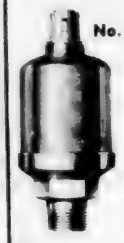
HOFFMAN

A COMPLETE QUALITY LINE...

No. 1A RADIATOR STEAM VENT VALVE
Adjustable vent ports, non-vacuum. Size conn.: ⅛". Max. oper. press. 10 P.S.I.

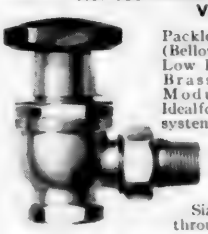


For either one-pipe or two-pipe steam, hot water, residential or industrial systems there's a Hoffman Trap, Valve, Pump or other specialty designed to give you better control of every requirement.



No. 75 STEAM MAIN VENT VALVE
Single Port float seals the port when water is encountered. Size conn.: ¾" male, ½" female. Max. oper. press.: 10 P.S.I.

No. 186 STEAM SUPPLY VALVE



Packless valve (Bellows Type). Low Pressure. Brass Body. Modulating. Idealfor vacuum systems.
Sizes ½" through 1½".

50 SERIES F&T TRAP

Operating Pressures to 125 P.S.I. Cap. from 70 to 12,000 lbs. of C.P.H. Cover which can be removed without breaking piping connections. Sizes ¾" to 2".

400 SERIES DIRT STRAINER

Cast iron body with brass perforated cylinder. Made in ½" through 3" pipe sizes. Max. press. 250 P.S.I. Can also be furnished with monel or stainless steel screens.

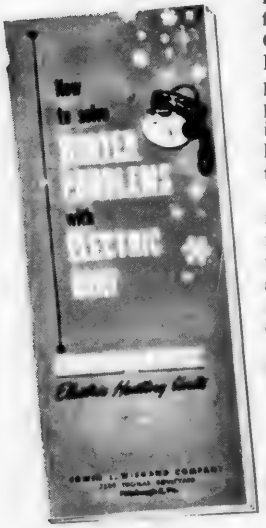
HOFFMAN SPECIALTY MFG. CORP., 1700 West 10th Street, Indianapolis 7, Indiana

Stuck Valves
Hard-to-Heat Spots
Frozen Pipes

Sluggish Materials
Underheated Rooms

Do something about it NOW!

This FREE book tells you how



Here's brand new application information on hundreds of uses of Chromalox Electric Heating Equipment for winter weather problems. These factual reports provide you with a rich source of ideas tailored strictly to winter heating problems in and around the plant and office.

Whether it's room heating, deicing, snow melting, warming of materials, or any of a hundred winter heating jobs, this exclusive information will show you how to solve the problem the electrical way.

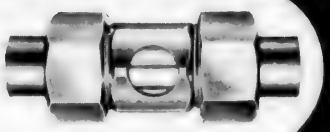
Edwin L. Wiegand Company
7588 Thomas Boulevard
Pittsburgh 8, Pa.

B-824

Write Today!

NEW! "250" SERIES **LIQUID EYE®**
POSITIVE SEALING INDICATORS

designed to save you even more time and money



6 sizes now available: ⅜", ½", ⅝", ⅞", 1⅛" and 1⅜" O.D.S.

The new "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- **smaller—more compact, simplified design.**
- **preformed copper extension eliminates need for separate gaskets—*foolproof* installation.**
- **complete, self-contained, economy unit.**

Ask your wholesaler now

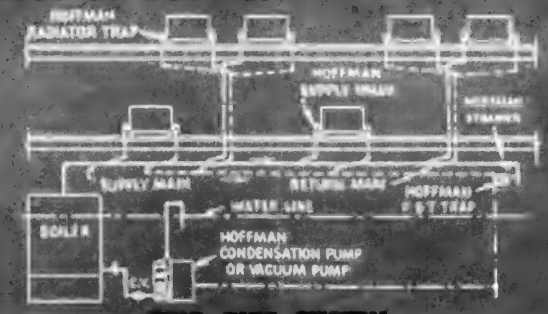
Write today for catalog covering the complete Allin line.

Allin **ALLIN MANUFACTURING CO.**
410 N. Hermitage Ave. • Chicago 22, Illinois
Over 1,000,000 Liquid Eyes Sold to Date!

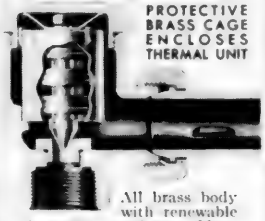
STEAM HEATING SPECIALTIES

. . . A SINGLE SOURCE OF SUPPLY

Each Hoffman product is distinguished by exclusive features that assure customer satisfaction and long, care-free service. This complete tested quality line is backed by a dependable, single source of supply and responsibility.



THERMOSTATIC TRAPS



All brass body with renewable thermostat and seat. Max. oper. pressure from 25 through 125 lbs. Capacities from 200 through 1250 lbs. condensate per hour.

VACUUM PUMPS

Jet Type Vacuum Producer used for most effective means of simultaneously removing air and water. Receiver is of heavy cast iron. Capacities 2,500 to 100,000 sq. ft. E.D.R.

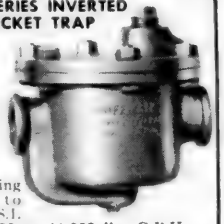
CONDENSATION PUMPS

Designed for operation at the higher pressures encountered in condensation pump service. All submerged parts are of bronze or other non-corrosive material. Cap. from 1,000 to 150,000 Sq. Ft. E.D.R.

No. 710 PRESSURE REDUCING VALVE

Single seated for continuous or dead end service. Max. high press. 250 lbs. per sq. in. Low pressure range 5 to 80 lbs. per sq. in. Sizes ½" through 1½" inclusive.

600 SERIES INVERTED BUCKET TRAP



Operating press. to 200 P.S.I.
Cap. 600 to 11,000 lbs. C.P.H. All working parts connected to bonnet. Sizes ½" through 1½".

Sold by leading wholesalers of heating and plumbing equipment.

New ANEMOTHERM AIR METER *gives you*

Air Velocity
Air Temperature
Static Pressure

with

PUSHBUTTON

ease

The new model 60 Anemotherm Air Meter helps you balance heating, ventilating and air conditioning systems the modern pushbutton way. It puts air velocity, air temperature and static pressure at your fingertips . . . pays for itself through time saved on only one major job. • **Write for Bulletin 55 giving all essential data.**

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ANEMOSTAT CORPORATION OF AMERICA
10 EAST 39th STREET, NEW YORK 16, N. Y.

TAGGED THE FINEST BY HEATING EXPERTS

PANELBLOC

Where gas — either natural, manufactured or LP is available, the overhead PANELBLOC can be the answer to commercial and industrial heating problems.

This infra radiant heater is low in first cost — economical to install. Needs no electrical connection. No fans, motors or moving parts. Automatic, noise-free operation.

Write for Bulletin.

THERMOBLOC

Thermobloc Direct fired warm air heaters are installed in almost every type commercial and industrial structure ALL AROUND THE WORLD. World leader in sales, THERMOBLOCS are manufactured and sold in 27 countries.

Full range of sizes, gas, oil or combination gas-oil firing.

Safety and Satisfaction are built right into THERMOBLOC.

Thermobloc Div., Prat-Daniel Corp. 8-12
5 Meadow St., So. Norwalk, Conn.
Please send bulletins on ☐ Panelbloc ☐ Thermobloc

Name .....
Address .....
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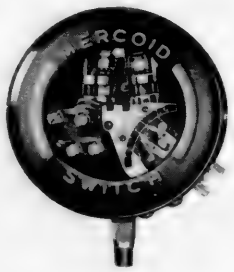
ONE CONTROL DOES 2 JOBS

MERCOID DA-400 SERIES
Pressure Controls are dual purpose controls, incorporating a single pressure element operating two separate, independently adjustable Mercoid magnetic switches. The switches may be used for multiple circuit control for various operations as the control responds to pressure changes.

For example:

- Close one alarm circuit at high pressure and another at low pressure with both circuits open over operating range.
- As an electrical interlock to open one circuit as pressure rises above and the second circuit as the pressure drops below operating range.
- To provide two-stage control by opening or closing one circuit on a rise in pressure and the second circuit on a further rise in pressure.

AVAILABLE IN 17 PRESSURE RANGES
0-30" VAC. TO 300-2500 PSI.



Equipped with calibrated dial and outside adjustments

Our engineers are at your service—send in your control problem or
WRITE FOR BULLETIN NO. 92.

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

NEW CATALOGS

Use the prepaid postcard on page 101 for securing your copies of catalogs described in this department.

HEATING, VENTILATING LINE—An expanded line of heating and ventilating products is described in an illustrated 12-page booklet published by Carrier Corp., Syracuse, N. Y. Catalog 46PQRV-72 is designed to show their application for large area buildings, schools, auditoriums and gymnasiums. Output ranges from 47,000 to nearly 2,000,000 Btu and from 1,500 to 32,000 cfm. Charts and tables show hot water ratings, steam ratings, and fan performance. A special section shows how to select the proper heating and ventilating units for various applications. .....**Item 71**

MOTOR CONTROLS—The 7th edition of its handy catalog is published by Allen-Bradley Co., Milwaukee, Wis. It contains 132 pages of operational, dimensional, and price data on the company's line of manual and automatic motor controls. An easy-to-use guide, conveniently indexed for quick reference, many types of inclosures which are available for operation in damp, hazardous dust, and gas locations are discussed and illustrated. .....**Item 72**

BOILER IS DESCRIBED—The Premier oil heating boiler is pictured and described in a 4-page catalog available from National-U. S. Radiator Corp., Johnstown, Pa. Charts describe ratings and engineering data, as well as dimensions and tapping sizes. A guide is also furnished on capacities and engineering data for domestic water heaters that can be used with the boiler. .....**Item 73**

V-BELT BULLETIN — Construction details of its grommet V-belt are described in Bulletin 20B6497C released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Belt's resistance to shrinkage, stretch and temperature rise is noted. .....**Item 74**

TEST GAGE CATALOG — An 8-page catalog (No. 400) dealing with the selection of test gages, cataloging a variety of test gages for various applications, and containing a list of check points for ordering pressure gages, is available from U. S. Gauge, Div. of American Machine and Metals, Inc., Sellersville, Pa. .....**Item 75**

ELECTRIC RADIANT HEATING—Available from General Electric Co., Providence, R. I., are two booklets dealing with the company's system of electric radiant heating. One, a design manual, simplifies calculations that are necessary prior to installation, and the other demonstrates in step-by-step fashion the procedures to be followed in the installation of electric radiant heating. .....**Item 76**

AIR-MIXING UNITS—A 4-page bulletin (DD-3) illustrating air mixing units for dual duct applications is available from Buensod-Stacey, Inc., New York, N. Y. Text and photos describe Type V3, for under-window or wall mounting, and Type H, for overhead installations. .....**Item 77**

WELDING RODS — A 4-page flyer, Bulletin DH-1218-J, is released by Page Steel and Wire Div., American Chain & Cable Co., Inc., Monessen, Pa. It details the physical properties as welded, analysis, average Rockwell hardness, and typical uses of gas welding rods, bare electrodes, automatic welding wire and metal spray wire. Comparison between the company's products and virtually all competitive makes are listed. .....**Item 78**

AIR TURNING VANES — Catalog F7912, covering air turning vanes, is completed by Barber-Colman Co., Rockford, Ill. Included is a description of the factory-fabricated, ready-to-install air turning device designed to give sweeping radius performance to the square duct corner, pressure loss data to determine the true elbow losses throughout the air distribution system, and sizing and ordering information. .....**Item 79**

WATER COIL CATALOG — Recold new water coil Catalog 53C6A, which presents several tables and charts that can be used by engineers in calculations for coil problems, is released by Refrigeration Engineering, Inc., Los Angeles, Calif. The charts include a complete table of nominal ratings for the 4, 6, and 8-row coils and also show when a coil is operating all wet, partially dry and all dry. Also incorporated in the catalog are a resistance to air flow chart, a chilled water selection method, and a rating table for various entering air and water conditions. .....**Item 80**

DIAPHRAGM CONTROL VALVE—A new bulletin on the Type 30 diaphragm control valve has been issued by the manufacturer, A. W. Cash Co., Decatur, Ill. The bulletin includes detailed information on the valve's available sizes, specifications and dimensions, pressure and temperature ratings, capacities, optional accessories and other data. .....**Item 81**

PACKAGE BOILERS—A 4-page bulletin describing outstanding boiler installations around the world is issued by Cleaver-Brooks Co., Milwaukee, Wis. Advantages of its packaged boiler are described. Installations in the Naval Hospital, Peru, Abbott Laboratories, Caracas, Venezuela, Del Prado in Mexico City are among those featured. Among domestic installations discussed are 69 boilers used by Dairymen's League Cooperative and installations at Immaculata College and Newberry Mills which report savings of thousands of dollars through modernization. .....**Item 82**

(*Continued on page* 146)

Engineers: Jaros, Baum and Bolles
Mechanical Contractors: Alvord and Swift

Conditioned air is delivered to all offices and public rooms of the new, modern Statler Hotel in Hartford, Connecticut, through Kno-Draft Adjustable Air Diffusers. Both round and square units are used—and a few of the new slot-type Kno-Drafts (not shown).

Primary reason for selection of Kno-Draft was the greater comfort assured by *draftless* air movement, uniform temperature, and the easy and accurate control of both air volume and flow pattern.

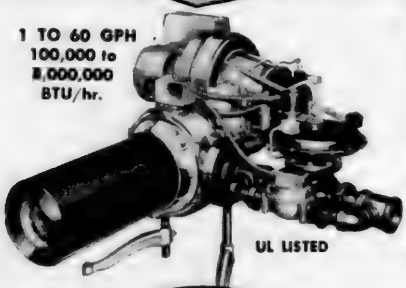
And notice how neatly the Kno-Draft squares fit into acoustical ceilings and how—square or round—the handsome Kno-Draft units blend unobtrusively with the architectural scheme of things.

For complete specifications, engineering and installation information on Kno-Draft round, square and slot-type diffusers, simply write on your letterhead to Connor Engineering Corporation, Dept. J-126, Danbury, Conn.

CONNOR
ENGINEERING
CORPORATION

kno·draft®
adjustable air diffusers

DUAL FUEL SITUATIONS NEED EXTRA THOUGHT



GAS syncro flame OIL

OIL/GAS BURNERS HAVE EXTRA FEATURES FOR SURER SUCCESS

In those situations where you can take advantage of off-peak gas rates, it is often possible to reduce heating costs substantially. The SYNCRO/FLAME Dual Fuel Burner is designed *especially for such circumstances.* Various distinctive features have been incorporated, to provide *outstanding performance.* One of these is . . .

AUTOMATIC CHANGE-OVER

. . . which can be accomplished by outdoor thermostat or any other suitable sensing switch. Other features include a positively non-pulsating gas flame, graduated light-off, pre-purge and post-purge on larger models, separate automatic adjustments for maximum efficiency with each fuel, and explosion-free gas control circuitry.

FREE LITERATURE

Write today for descriptive circulars describing all features, and giving full specifications on wide range of sizes available. Ask for Catalog 551.

MANUFACTURERS OF OIL AND GAS AND OIL/GAS BURNERS

SYNCHRONOUS FLAME, INC.

WALWORTH • WISCONSIN

NEW CATALOGS

(*Continued from page* 144)

Use the prepaid postcard on page 101 for securing your copies of catalogs described in this department.

COOLING THEORY AND PRACTICE—Written expressly for the warm air installer, this cooling manual is prepared by the chief engineer of International Heater Co., Utica, N. Y. It explains the theory of cooling and the various types of equipment. A complete installation is illustrated. From sizing the cooling unit through the charging and final purging, every step is carefully covered so that the heating contractor should be able to make his first cooling installation with little if any outside help. The price of the manual is one dollar. . . . . **Item 83**

LOW HP FLUID DRIVE—A 16-page illustrated catalog covering fluid drives for ½ to 25 hp applications is available from Hydraulic Coupling Div., American Blower Corp., Detroit, Mich. Bulletin 9119 describes the company's class 2 units for industrial use in the low horsepower range. Typical performance curves compare starting torque, starting current and heat generation characteristics of a general purpose a-c motor direct-connected to a load with those of a similar motor utilizing the company's fluid drive. Other charts show typical adjustable speed torque curves with NEMA Design B motor for various degrees of filling and the effect of load ring size on torque hyphenate speed characteristics. . . . . **Item 84**

STEAM HEATING SPECIALTIES — An 8-page catalog illustrating the company's complete line of steam heating specialties is offered by Dunham-Bush, Inc., West Hartford, Conn. These products include radiator valves, float and thermostatic radiator traps, inverted bucket traps, strainers, air eliminator air checks, and gauges for steam, oil, gas and water. Specification data covers dimensions, weights, sizes and capacities. . **Item 85**

LUBRICATED PLUG VALVES — A 28-page catalog, available from Homestead Valve Mfg. Co., Coraopolis, Pa., shows the company's lubricated plug valves in a variety of metals and ratings. Complete with engineering dimensions, this catalog also shows different types of power operators for valves, in addition to complete lines of lever operated, and worm and gear operated valves. . . . . **Item 86**

HEATING AND COOLING CATALOG—A 4-page condensed heating equipment catalog (No. 256) presenting its line of air conditioning units, heating and cooling coils, unit heaters, and convectors is available from Young Radiator Co., Chicago, Ill. . . . . **Item 87**

CLAMP FOR PLASTIC PIPE — Ideal Corp., Brooklyn, N. Y., manufacturers of Hy-Gear stainless steel clamps for use on plastic pipe, offers an application chart which shows the correct size clamp to be used with any given size and type of plastic pipe. The chart is divided into two sections, one covering standard wall, 75 psi pipe, the other covering heavy wall, 100 psi pipe. Each section lists the various sizes of plastic pipe available and shows the correct size clamp to be used. . . . . **Item 88**

UNIT VENTILATOR — A combination electric heating and ventilation unit for schools and offices is described in a bulletin by Wesix Electric Heater Co., San Francisco, Calif. A motor-driven electronic control unit maintains set temperature and air conditions. . . . . **Item 89**

PUMPS AND WATER SYSTEMS—A 26-page catalog featuring a new line of Silver Jet pumps and water systems is available from the Duro Co., Dayton, Ohio. The catalog also gives information on other pumps and systems. These include submergible, Elect-O-Stage, centrifugal and sump pumps and piston and rod type pumps and systems. A page is devoted to information for dealers. It gives the approximate water requirements for home and farms, conversion factors and other useful data. Charts, tables, photographs, and cross-section drawings illustrate features. . . . . **Item 90**

PERIMETER PIPING SYSTEMS—A guide to the advantages and selection of perimeter piping systems for forced hot water heating, with classroom unit ventilators and convectors has been issued as a 24-page engineering data supplement by Herman Nelson Unit Ventilator Products, American Air Filter Co., Inc., Louisville, Ky. It is designed to assist engineers in the selection, specification and application of forced hot water heating. . . **Item 91**

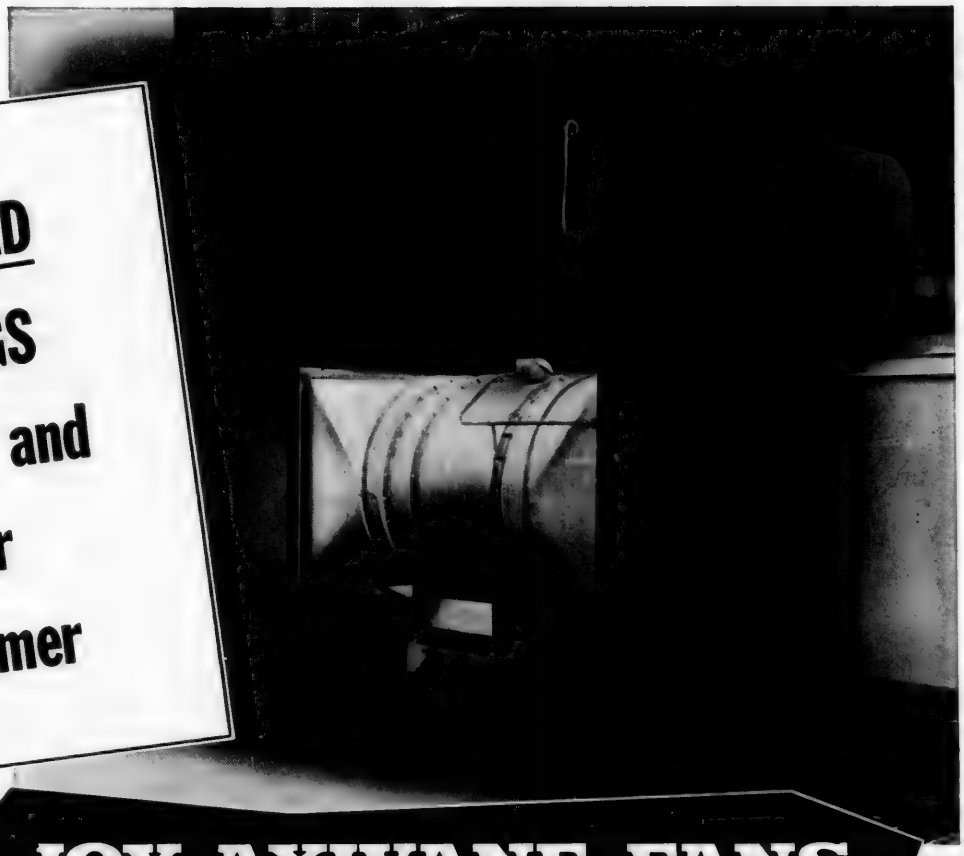
FUEL OIL HEATER—Catalog 60-N describing safety-type fuel oil heaters, with 100% counterflow, a safety barrier of heat transfer liquid between oil and water, and no electric warning, is published by Davis Engineering Corp., Elizabeth, N. J. . . . . **Item 92**

BACKWARD CURVE FANS—A new design in backward curve airfoil centrifugal fans is presented in a 64-page, illustrated booklet published by Chicago Blower Corp., Franklin Park, Ill. Requirements for commercial and industrial ventilating, air conditioning, and forced and induced draft heating are discussed, together with noise levels, rotary speeds, and mechanical efficiency. . . . . **Item 93**

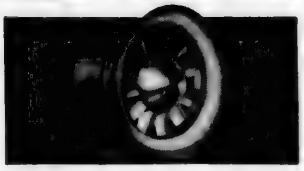
SEWER CONSTRUCTION PRACTICES—A 4-page, illustrated bulletin discussing good practices in sewer construction is published by Clay Sewer Pipe Assn., Columbus, Ohio. Data on proper techniques for finishing, backfilling, inspection and trench preparation, including trench width, depth and bedding, are included. . . . **Item 94**

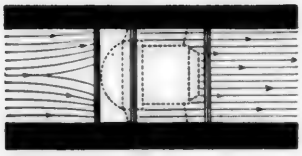
(*Continued on page* 148)

PLANNED SAVINGS for you and your customer



with JOY AXIVANE FANS





SAVE POWER The unique vaneaxial design utilizes aerodynamic blades with close tip tolerance. Internal vanes recover the rotative energy of the air from the blades and convert that energy to velocity and pressure. Result: high performance at low cost.

SAVE SPACE In-line design permits installation right *in the duct.* The photograph above, at Minneapolis-Honeywell Company, illustrates this feature. The fan, which supplies air to two large floors, utilizes an area only 54″ in diameter and 26½″ long. Result: exceptional economy of space.

SAVE INSTALLATION COSTS In-the-duct mounting of Joy Axivane Fans is easily and quickly accomplished, and requires only the simplest supports. Result: reduced labor time and costs.

Thus, the remarkable efficiency of the Joy Axivane Fan design . . . in contrast with other air-moving machines . . . gives you great savings in power, space, and labor. . . . And remember, the bigger the job, the greater the margin of benefit you enjoy. For full details, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 55-40

Consult a Joy Engineer

for VANEAXIAL FANS • COMPRESSORS • OXYGEN GENERATORS
VACUUM PUMPS AND BOOSTERS

WSW 15956-55

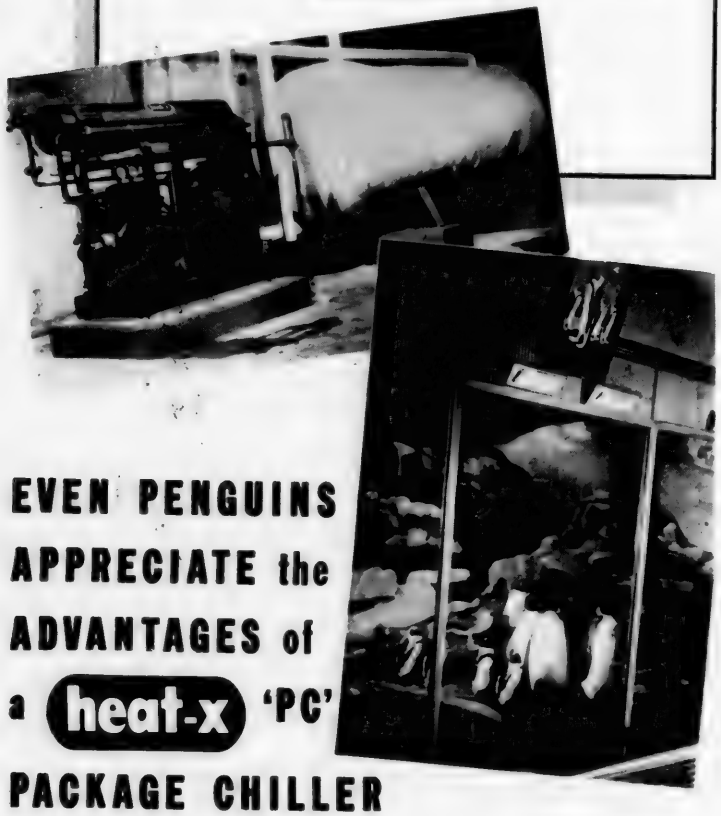
JOY

WORLD'S LARGEST MANUFACTURER OF VANEAXIAL-TYPE FANS

CASE HISTORY

Another Space-Saving Application of Heat-X 'PC' Package Chillers.

National Zoological Park
Washington, D.C.



EVEN PENGUINS APPRECIATE the ADVANTAGES of a heat-x 'PC' PACKAGE CHILLER

Only with a Heat-X 'PC' Package Chiller could the desired capacity be obtained while allowing sufficient space for the required 400 gal. storage tank.

Here, chilled water maintains the penguin pool at 35° F . . . is also used to hose down cage floor and maintain cage temperatures at approximately 40° F.

Patented Inner-Fin® design of 'PC' Package Chillers makes possible this maximum capacity with minimum bulk. All-copper construction of water passages eliminates any corrosion problem . . . assures continued satisfactory operation.

Write for complete information on Heat-X 'PC' Package Chillers in 2 HP through 100 HP models.

HEAT-X, Inc.
BREWSTER • NEW YORK

NEW CATALOGS

(*Continued from page* 146)

Use the prepaid postcard on page 101 for securing your copies of catalogs described in this department.

PRESSURE REDUCING VALVES—Use of high pressure reducing and relief valves in plastics molding operations is the subject of a brochure offered by Atlas Valve Co., Newark, N. J. The installation and operation of the valves in a New Jersey plastics molding plant are described where initial pressures of 5000 psi have to be accurately controlled at much lower pressures for molding plastics material. Pointers described therein can be applied to any industry where simplified hydraulic pressure reducing hookups are desirable. . . . . **Item 95**

PIPE INSULATION TAPE — Techniques for protecting underground pipe from corrosion with Scotchrap brand pipe insulation tape is the subject of a booklet, Tape It Easy, offered by Minnesota Mining and Manufacturing Co., St. Paul, Minn. The 24-page booklet provides photographs and instructions for wrapping bends and fittings, preparing joint surfaces for wrapping, wrapping welded joints, and taping straight pipe sections. . . . . **Item 96**

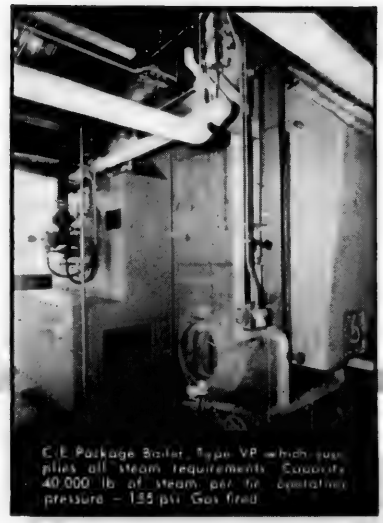
FLEXIBLE PLASTIC TUBING—The properties and uses of Tygon flexible plastic tubing are described in a 27-page booklet, Bulletin T-97, offered by U. S. Stoneware Co., Akron, Ohio. The booklet explains that various treatments of the basic Tygon resin results in varying physical, chemical, and electrical properties depending on the required application, and describes in detail the properties and applications of the plastic tubing formulation of the basic resin. . . . . **Item 97**

PRE-FORMED DUCT INSULATION—Preformed glass fiber duct liner for acoustical and thermal insulation is illustrated in a 4-page brochure issued by the Insul-Coustic Corp., Maspeth, N. Y. Its high degree of sound absorption and thermal insulation value is discussed. . . . . **Item 98**

PRECISION VALVES—Bulletin S-2021 R, describing its complete line of precision valves, is published by Circle Seal Products Co., Inc., Pasadena, Calif. It contains illustrations of the company's valve line and technical information. . . . . **Item 99**

COOLING TOWER BULLETIN — Basic changes to the Wat-R-Miser line of cooling towers, manufactured by Drayer-Hanson Div., National-U. S. Radiator Corp., Los Angeles, Calif., are listed in a 4-page leaflet, Bulletin C-H 56110, available to architects, engineers, and air conditioning contractors and installers. The leaflet is sequentially organized to simplify selection of the towers. . . . . **Item 100**

(*Concluded on page* 150)



C-E Package Boiler, Type VP — which supplies all steam requirements. Capacity 40,000 lb of steam per hr. Operating pressure — 135 psi. Gas fired.

"RELIABLE—ECONOMICAL —LOW ON MAINTENANCE"

Says Mr. Max R. Spencer—Superintendent Central Soya Co., Inc.—McMillen Feed Mills

From an original water color of the Central Soya Co., Inc. — McMillen Feed Mills by Kent Day Coes. Commissioned by "Factory" magazine for their 1956 Significant Plant Awards.

"Our package boiler, after 18 months of operation, has proven to be very reliable, economical and low on maintenance costs. Ease of start-up, shut-down and continuous operation permitted quick training for our operators."

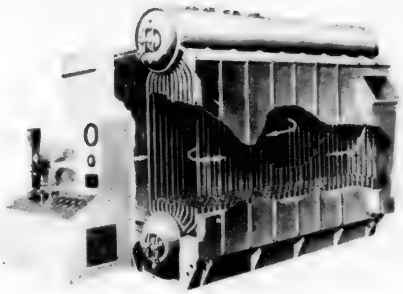
Mr. Max R. Spencer, Maintenance Superintendent of the Central Soya Co., Inc.—McMillen Feed Mills—of Chattanooga, Tenn., was referring to his C-E Package Boiler, Type VP, when he made that statement.

It's a boiler that has to be good—has to be reliable—for it is presently the sole source of steam supply for this outstanding plant. And it *is* an outstanding plant having been named one of "The 1956 Winners of Factory's Significant Plant Awards."

Central Soya is a real, modern "triple threat" operation. It comprises: (1) mammoth new grain-handling elevators, (2) feed mill, and (3) soybean solvent extraction plant all integrated into a smoothly operating "continuous process" plant that is expandable and ready for any foreseeable need.

Combustion Engineering is proud that its VP Package Boiler has been assigned a key role in the operating plan of this notable mill. Gratified, too, that it is proving to be all that Mr. Spencer had hoped for.

A C-E Package Boiler, Type VP can do the same kind of a job for you. Let us give you more information.



Cutaway view of typical VP Boiler. For capacities from 4,000 to 40,000 lb of steam per hr. Pressures to 500 psi. Oil or gas fuel.

COMBUSTION ENGINEERING

C-E

R-9628

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200 Madison Avenue, New York 16, N. Y.
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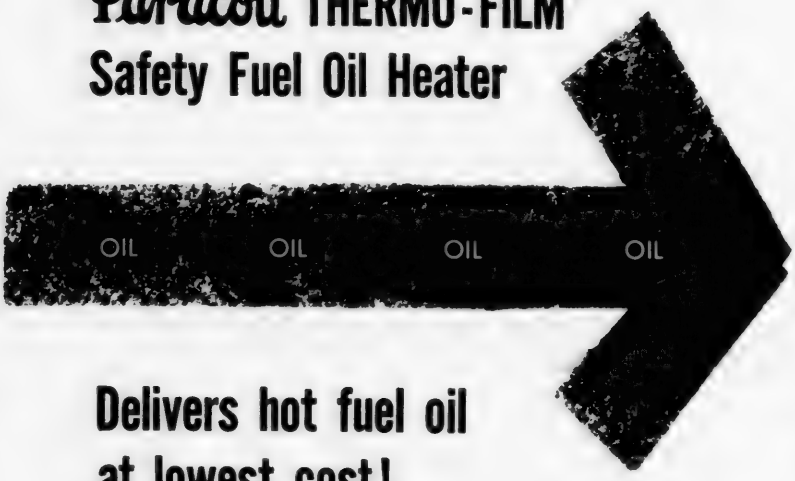
Steam Generating Units • Nuclear Reactors • Paper Mill Equipment • Pulverizers • Flash Drying Systems • Pressure Vessels • Home Heating and Cooling Units • Domestic Water Heaters • Soil Pipe

Paracoil THERMO-FILM* Safety Fuel Oil Heater

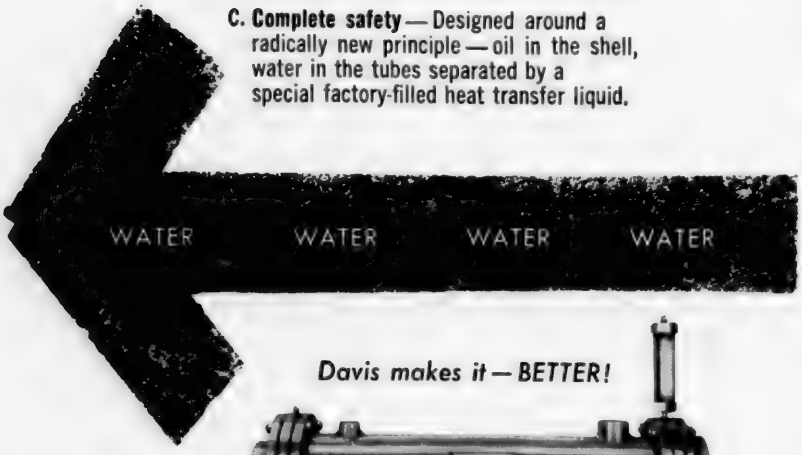


Delivers hot fuel oil at lowest cost!

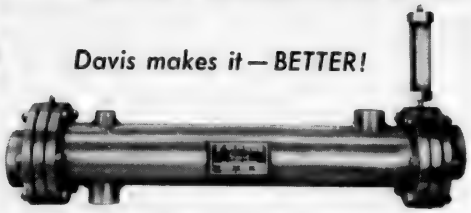
a. **High oil exit temperatures** — Full rated capacity because of 100% true counter-flow straight tube construction. And, extended tube surface greatly increases heat transfer capacity.

b. **Cheaper installation** — No electric wiring. No warning systems to install. Lightweight, compact unit requires no special supports.

c. **Complete safety** — Designed around a radically new principle — oil in the shell, water in the tubes separated by a special factory-filled heat transfer liquid.



Davis makes it — BETTER!



LOWER FIRST COST...LOWER INSTALLED COST

Approved by Board of Standards and Appeals, City of New York. Cal. No. 321-55SA

Write for Bulletin 60 N.

DAVIS ENGINEERING CORPORATION

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1064 East Grand Street, Elizabeth 4, New Jersey ELizabeth 2-6780

*Trademark/Patent Pending

NEW CATALOGS

(*Continued from page* 148)

Use the prepaid postcard on page 101 for securing your copies of catalogs described in this department.

EXPLOSION-PROOF MOTORS — Latest design features of its explosion-proof motors in NEMA rerated ratings of ½ to 30 hp, type GZZ, and in non-rerated ratings of ½ to 100 hp, type APZZ, are described in Bulletin 51B-7286G issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis. In addition to cutaway views of the motor, the bulletin includes tables of ratings and dimensions as well as a horsepower frame chart. . . . . **Item 101**

PVC ENGINEERING DATA—Data on its line of unplasticized polyvinyl chloride pipe, fittings and valves are given in the new 16-page engineering catalog published by Colonial Plastics Mfg. Co., Cleveland, Ohio. The catalog covers both the chemically-resistant, normal-impact and chemically-resistant, high-impact types. Physical properties, chemical resistance tables, pipe, fitting and valve dimensions, and flow rate charts, as well as useful pipe assembly and installation data are discussed. . . . . **Item 102**

FIBER PIPE BULLETIN — Fiber pipe Bulletin No. 56040, being offered by Line Material Co., Milwaukee, Wis., contains the latest application and installation information about bituminized Permaline root-proof or perforated pipe and fittings. The 28-page bulletin describes various types of soil; suggests a trench preparation for each; recommends installation methods for drainage, sewer, and septic systems; lists weight and sizes of pipe and fittings; and provides shipping and handling information. . . . **Item 103**

CAST IRON BASEBOARD PANELS—Its line of cast iron radiant baseboard panels for all hot water and two-pipe steam systems is illustrated in Form 146-2 Rev., published by Plumbing and Heating Div., American Radiator & Standard Sanitary Corp., New York, N. Y. Panel construction, styling, and installation is illustrated and discussed in this 4-page brochure. A rating table is included. . . . . **Item 104**

SURFACE THERMOMETER DATA — A test instrument capable of full-scale indication on a one-second surface contact, is described in a leaflet identified as Form 2P756 by Royco Instruments, Albany, Calif. It is illustrated in use with a close-up of the dual Fahrenheit and Centigrade scales linearly calibrated from 0 to 650 F. An outline drawing and a list of specifications and features are included as well as a detailed cross-section of the low-thermal-load tip which permits effective readings to be made on insulating materials. . . . . **Item 105**

(*Concluded on page* 152)

ONE doesn't fit ALL needs!

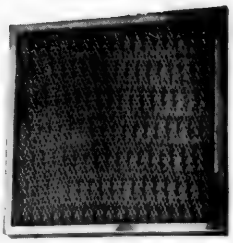
Get *Airsan* Filters
ENGINEERED TO FIT THE JOB — RIGHT EVERY TIME

No filter does all jobs, meets every need. That's why Airsan Filters are engineered to the job to offer more effective dust collection. Airsan's expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing. It distributes air easily over the entire filter area. Provide high filtering efficiency and dust holding capacity with less resistance. Features include all galvanized construction and welded lock corners. Write for data.

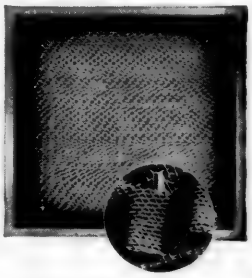
Send for Free Bulletins

AFI MEMBER AIR FILTER INSTITUTE

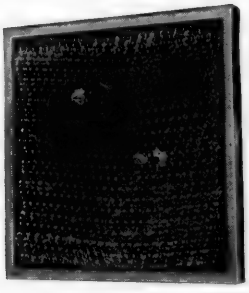
AIR FILTERS
(Low Velocity)
Viscous type, permanent and cleanable designed for industrial, commercial and domestic use. Available in 1" and 2" thickness.



VIRO-CRIMP
(High Velocity)
Has a specially designed high velocity Viro-Crimp filter core. Hemmed edges provide a safety feature. Operates efficiently at 300 to 500 fpm. Available in 2" and 4" thickness.



GREASE FILTERS
Permanent, cleanable type Airsan Grease Filters made especially for range canopies, galleys, kitchens. Available in 2" thickness.



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for any liquid for high pressures for high temperatures

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If you have a liquid level control problem that involves a float, send for Harris Float Catalog with its complete technical data on the various types, sizes of floats, and the metals suitable for different corrosive liquids, temperatures, and pressures.

Harris Floats are made in sizes from 2½" to 14" diameter in ball, cylinder, conical, rectangular or disk shapes of Copper, Stainless Steel, Aluminum, Nickel, Monel, or Steel or other suitable, workable metals.

Harris engineers, with a background of 72 years of experience, will be glad to help you select or design the right float for your installation.

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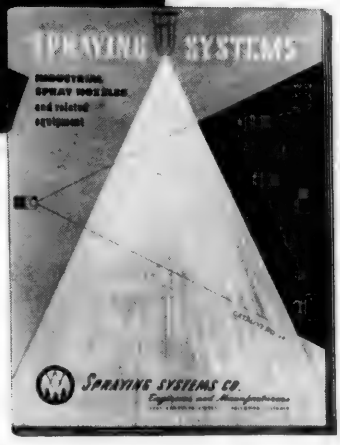

- to help you improve a spraying operation
- to help you lower a spraying cost

The most complete industrial spray nozzle catalog ever produced. Gives you reference data on thousands of standard and special spray nozzles for every type of spraying.

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SPRAYING SYSTEMS CO.
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VIBRATION CONTROL

1500 Massachusetts Ave. Corp.—Owner
Ring Engineering Co.—Builder
F. Wallace Dixon—Architect
Korsunky, Weller & Gooch—Consulting Engineers
Standard Engineering Co.—Mechanical Contractor

lets you

PUT 'EM ON THE ROOF!

The roof, or an upper floor, is the best place for heating and air conditioning equipment, keeps basements free for other revenue-producing uses such as parking, storage, etc.

Korfund Vibration and Noise Control units let you install heavy boilers, compressors, fans, etc., without transmitted vibration to floors below. The photograph shows a boiler being hoisted to the roof of the 8-story 1500 Massachusetts Ave. apartments in Washington, D. C. The completed installation, which included Korfund-mounted boilers, pumps, compressors and fans, has been in operation for well over a year now, and the tenants on the floor immediately below don't even know of the existence of the equipment immediately over their suites.

This is just another example of the effectiveness of Korfund units. Their efficiency did not come about by accident — it's the result of more than a half-century of experience in the vibration and noise control field. Why not put this experience to work for you?

Write for a copy of the booklet, "Air Conditioning Goes Up in the World," which describes Korfund's role in vibration and noise-free upper floor installations. We'll also include a copy of "Vibration Control Specifications for Air Conditioning Equipment." Ask for Bulletin 31.

For specific recommendations contact us or one of the 46 local Korfund offices. Look under "Korfund" in your local Telephone Directory or in Thomas' Register.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-01E Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

NEW CATALOGS

(*Continued from page* 150)

Use the prepaid postcard on page 101 for securing your copies of catalogs described in this department.

HYDRAULIC FAN DRIVE — Bulletin 3009, describing its hydraulic fan drive for air-cooled heat exchangers and cooling towers, is issued by De Laval Steam Turbine Co., Trenton, N. J. The six-page illustrated bulletin includes detailed information on the motors, pumps, and worm gear reducers that make up the fan-drive unit. Also included are performance curves useful for selecting the right unit. ..... **Item 106**

GAS CONVERSION BURNERS — Specifications, dimensions, approximate shipping weights and unique features of the various models in its line of multiple jet rectangular gas conversion burners ranging from 50,000 to 2,100,000 Btu per hr is offered in a bulletin by Barber Mfg. Co., Cleveland, Ohio. ..... **Item 107**

COOLING TOWERS — Twenty-four sizes of quiet-operating cooling towers for business and industry are described in the new 12-page Bulletin 477-A offered by the Binks Manufacturing Co., Chicago, Ill. Dimensions and approximate weights are given for each of the cooling towers which range from 5 to 360 tons of refrigeration. Selection tables for a wide range of design wet bulb conditions are also included. ..... **Item 108**

V-BELT ENGINEERING MANUAL — A 66-page V-belt drive engineering manual for users and designers is available from Maurey Mfg. Co., Chicago, Ill. Sec. 1 is devoted to drive service factors, instructions on how to detect a stock drive and tables for A- to E-section V-belts. Sec. 2 provides design instructions and data. Sec. 3 gives general information on the company's engineering, research, production, and service. ..... **Item 109**

SMALL MOTORS TAILOR MADE — Motors from 1/300 to ⅓ hp engineered based on characteristics desired and specified by the user are offered by R. A. Boehm Co., Merrick, L. I., N. Y. A 2-page brochure describes its line of shunt-wound, shaded-pole, and permanent-magnet motors. Included is an engineering data sheet to be used by a prospective buyer. ..... **Item 110**

MOTOR SIZE SELECTION — Bulletin GED-2020B, available from General Electric Co., Schenectady, N. Y., gives information on selecting the correct fractional horsepower motor for various uses. The bulletin explains the terms horsepower, starting ability, shaft speed, and voltage, and contains motor selection data for 50 typical applications. ..... **Item 111**

AUTOMATIC HUMIDIFICATION — Humidity theory is discussed and applied to the selection of Aprilaire humidifiers in a 12-page sales and service guide published by Research Products Corp., Madison, Wis. Measurement of and effect of temperature on relative humidity, how moisture is added to air, effect of water characteristics, and factors determining required evaporation, are among the subjects covered. Application data apply to homes, apartments, and offices. ..... **Item 112**

CONDENSER WATER TREATMENT—Its line of chemicals for water treatment in condenser and cooling tower applications is described, along with data on the maintenance of this type of equipment, in Bulletin 54 published by Anderson Chemical Co., Macon, Ga. Among topics discussed are: figuring water capacities of tower basins; blowdown and washout; water analysis service; the company's condenser cleaner; water treatment, algaecide, and their applications. ..... **Item 113**

EVAPORATOR PRESSURE VALVE—Bulletin F-M-112 illustrating and describing its redesigned evaporative pressure regulating valve is released by A-P Controls Div., Controls Company of America, Milwaukee, Wis. The valve, which permits the operation of two or more evaporators at different temperatures with a single condensing unit, is installed in the higher temperature suction line. ..... **Item 114**

FRESH WARM AIR FOR SCHOOLS — A technical folder on its gas-fired, forced air schoolroom heating and ventilating system is issued by Norman Products Co., Columbus, Ohio. Bulletin HVS-156 contains a description of the company's individual classroom package which includes furnace and enclosure unit with electrically controlled damper assembly for mixing outdoor air and room air, standard length Util-i-Duct bookshelf sections for forced air distribution, and a description of operation cycles during warm-up, daytime, and night periods. Included also are dimensional drawings of furnace and enclosure unit, bookshelf section, and outside wall openings for fresh air and combustion air. ..... **Item 115**

GASKETS, SHIMS, AND WASHERS—A 28 page catalog illustrating and describing gaskets, shims and washers, is released by Chicago-Wilcox Mfg. Co., Chicago, Ill. Data on ring, cylinder head, double jacket, corrugated metal, plain solid, self-sealing, and special types of gaskets as well as gaskets cut from a wide range of materials, and a complete section listing more than 1500 stock dies available are included. ..... **Item 116**

Use the prepaid postcard on page 101 for securing your copies of catalogs described in this department.

"Reznor sectional duct furnaces let us design the ideal heating-cooling system for each job"

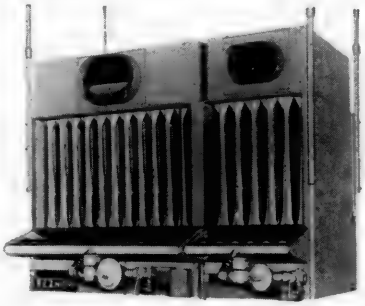
"We'd never been able to design a really ideal heating-cooling system until Reznor introduced their sectional duct furnace. And even if we had designed one, installation problems would have been stymied until the Reznor sectional duct furnace came along.

"Sectional assembly eliminates the installation problems which formerly prevented the use of large capacity custom-engineered duct systems. With the new Reznor DS sectional duct furnaces, we can specify system capacities of two million BTU or more knowing that they can be assembled on the job from sections weighing no more than 315 pounds.

"Reznor sectional duct furnaces free us completely from packaged heating equipment which isn't exactly right for any one job because it has to be almost right for so many jobs. Now we start with a Reznor duct furnace, which is simply nothing more than a compact, highly efficient gas-fired heat exchanger with a complete set of combustion controls. To this we add the components for air moving, cooling, cleaning, and humidifying selected to meet exact job requirements. For our client it means greater efficiency, greater comfort, and lower cost.

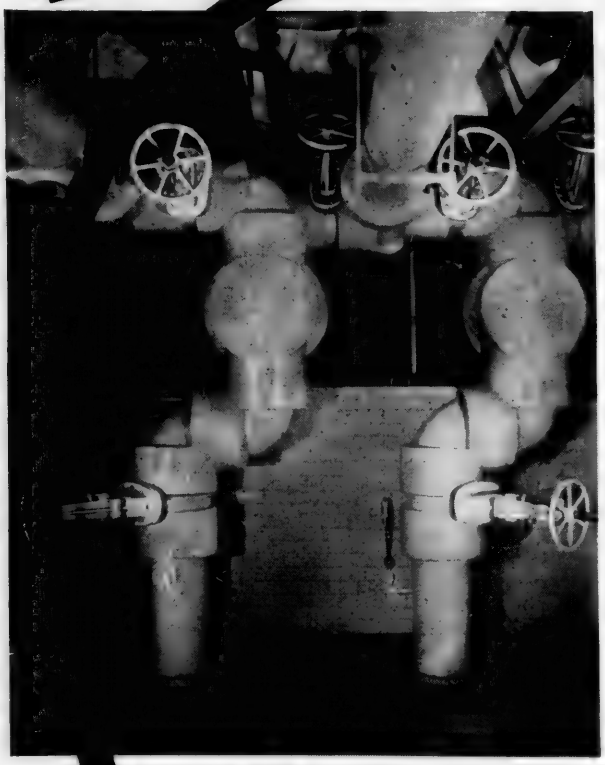
"Reznor sectional duct furnaces are a heating engineer's dream come true . . . and our long experience with Reznor gas unit heaters gives us complete assurance that these new duct furnaces will be tops in efficient performance, dependable service and long life, too."

If you're not taking advantage of the design freedom these new units offer you, you're really missing something. Write today for free catalog or call your nearby Reznor distributor for details. You'll find him listed under "Heaters-Unit" in the yellow pages of your telephone directory.



REZNOR
THE WORLD'S LARGEST-SELLING GAS UNIT **HEATERS**
REZNOR MANUFACTURING COMPANY
64 Union Street, Mercer, Pa.

Proved DEPENDABLE



- Call it reliable!
- Call it rugged!
- Call it dependable!
- If it is a Fairbanks valve . . . it has it!

Thousands of installations under every condition from the simplest to the most difficult, prov. Fairbanks valves give dependable service, require less maintenance, last longer — often succeed where other valves fail!

That is why you find more uninterrupted service, less shutdown, in plants that specify Fairbanks 125-pound Iron Body Gate Valves — the valves with proven dependability built in!

Fairbanks Iron Body Gate Valves are bronze mounted* both with inside non-rising screw and outside screw and yoke. Available with screwed or flanged ends. Bodies and bonnets made of high strength alloy cast iron. Wedges in 2" to 4" sizes of solid bronze; in larger sizes to 24", wedges are alloy iron with rolled in bronze face rings and bronze bushed stem connections. The threaded bronze seat rings are screwed into body at angle conforming to taper of wedge.

(*ALL IRON GATE VALVES ALSO AVAILABLE.)

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BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

BITUMINOUS COAL TRENDS—The National Coal Association has published a 164-page book on Bituminous Coal Trends in 1956 and it presents, for the first time, a birdseye view of world and United States energy trends and the role of the coal industry in meeting that trend. In addition to chapters on energy and markets, the book contains chapters on production, transportation, labor, safety, research and reserves. There have been large increases in the demand for coal by electric utilities, the steel industry and for exports to countries abroad that outran their own capacity to produce energy. A single copy of this book is free. National Coal Association, 802 Southern Building, Washington 5, D. C.

COOLING TOWERS—Reports on a number of special studies have been issued by the Cooling Tower Institute. Bulletin WMS-104 is an interim report on Wood Maintenance for Water Cooling Towers. It is a study and analysis of the deterioration of redwood in cooling towers, and observations on the effect of preservative treatments. Price, $1.50. Bulletin STD-103, covers Redwood Lumber Specifications for Application in Industrial Water Cooling Towers. It covers CTI grades of redwood lumber and framework design data. Price, $1. Bulletin ATP-105 presents Acceptance Test Procedure for Industrial Water Cool Towers—specifically the mechanical draft type. Price, $1. Cooling Tower Institute, Palo Alto, Calif.

THERMAL ASPECTS OF THE LIGHTING SYSTEM—A special report has been issued by a joint committee of the Illuminating Engineering Society and the American Society of Heating and Air Conditioning Engineers, on A Study of the Thermal Aspects of the Lighting System. It presents information on the relationship between lighting and the various factors that enter into air conditioning. American Society of Heating and Air Conditioning Engineers, 62 Worth St., New York 13, N. Y. Price, 75 cents.

BURNER FUEL OILS—Bureau of Mines Information Circular 7762 presents a report on the properties of fuel oils for burners that was produced during 1956. Data on a total of 427 samples of burner-fuel oils are represented. These oils were the products of 123 refiners throughout this country and Canada. U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

PROFESSIONAL CONSULTANTS' OPERATIONS AND TECHNIQUES—A brief survey of problems of the consulting profession is contained in a publication of this title issued by the Industrial Department, Los Angeles Chamber of Commerce. The report compiled by Dr. C. C. Crawford, University of Southern California, represents a unique approach to group planning. The sponsors hope that this report, and the program of professional growth activities which will merge from it, will be instrumental in increasing the contribution of the consultant to the business and civic life of his community. Industrial Department, Los Angeles Chamber of Commerce, Los Angeles, Calif.

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HEAVY DUTY

STEAM COILS

(DISTRIBUTOR TYPE)

Tilted feature assures drainage of condensate whether used for vertical or horizontal air flow.

HEAVY DUTY CONSTRUCTION

Cover pieces at header and stub ends are perforated to allow passage of measured amount of by-pass air —gives increased coil capacity—eliminates hot end stress. Every square foot of face area produces equal heating capacity on full or modulated steam supply. Two row or one row available. *Write for details*

HEAT TRANSFER EQUIPMENT REMPE CO. Founded 1890

REMPE COMPANY

358 N. Sacramento Blvd.
Chicago 12, Illinois

Get the same air delivery with only ⅓ the weight!

Model BD-43 is only 41½" high, delivers up to 16,500 cfm

New COOK all-aluminum belt-drive centrifugal ventilator

- Saves up to 400 lbs. on large models
- Only 6" high roof curb required
- Weatherproof aluminum shell and base
- Aluminum centrifugal wheel
- Compact belt-drive
- Low silhouette
- Non-overloading wheel, low tip speeds
- Rubber-mounted drive assembly
- From 1,000 to 16,500 cfm

The new Cook Model BD belt-drive ventilator eliminates heavy roof loads. Model BD-43, 16,500 cfm size, weighs only 250 pounds. Low tip speeds assure quiet operation. Light starting torque of the aluminum blower wheel increases bearing, motor and belt life. Are also available in Direct Drive Models from 7" to 30" sizes. Write for Catalog HV.

HINGED HOOD, motor and belt-drive easily inspected.

EASY TO CLEAN. Remove four bolts and shell lifts off.

COOK VENTILATORS

LOREN COOK COMPANY
Berea, Ohio

Cook Ventilators are shown in the 1956 Sweets' File

EXHAUST...

WHEN You Want It

WHERE You Want It

FOR EVERY INDUSTRIAL APPLICATION

with FLEXAUST® hose

In a large midwestern chemical plant, 12" I.D. Flexaust Hose is used to exhaust fumes and heat from a flame-cutting operation. The hood to which the Flexaust hose is attached is carried on a movable boom, putting the exhaust exactly where it is needed. Available in 1¼" to 36" I.D.

EASY TO INSTALL

• Unskilled labor can cut and install Flexaust duct quickly and easily. A set-up like this one can be easily installed and just as easily moved to meet changes of process or relocation of machines. It can be cut to any length, and is easily coupled to any other duct work.

HIGHLY FLEXIBLE

• No layout problems with Flexaust! Made of nylon or cotton base impregnated with age-resistant Neoprene compound and reinforced with spiral wire, it will not kink or flatten. It maintains its cross-section even on sharp bends. As it has excellent lengthwise compressability, it is easy to transport and store.

LONG LASTING

• Flexaust is highly resistant to corrosion, moisture, chemical deterioration and flexing fatigue. Its bonded, double ply, double overlap construction makes it fully air-tight for pressure, suction or gravity operations. It outlasts other types of ducts in handling abrasive dusts as in grinding, materials handling, etc.

You can use Flexaust for fume exhaust, for dust or chip collection, for ventilation, for handling of bulky materials. In every application it proves its economy in first cost and simplicity of installation . . . its efficiency in its performance and adaptability to all types of jobs. Also available, retractable type Portovent duct.

Write today for bulletins giving complete data on flow characteristics, installation procedure, sizes, fittings and accessories.

THE FLEXAUST COMPANY

Dept. HV-12, 100 Park Avenue, New York 17, N. Y.

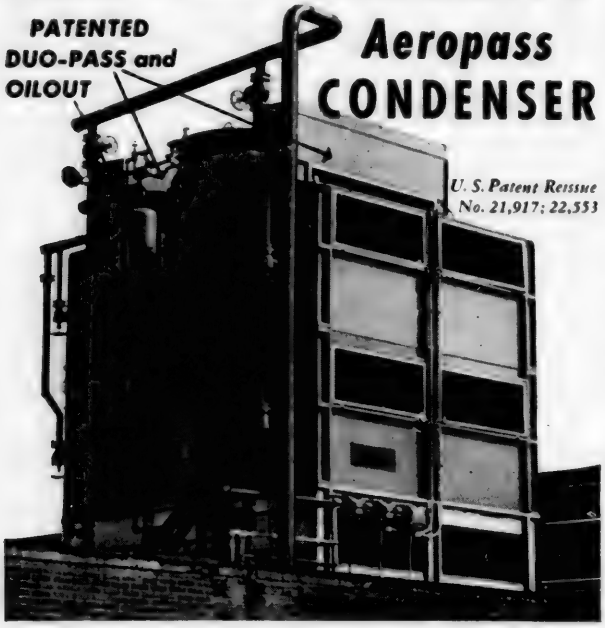
Formerly American Ventilating Hose Co.

Stocks are available from coast to coast

400 TONS CAPACITY

PATENTED DUO-PASS and OILOUT

Aeropass CONDENSER



U. S. Patent Reissue No. 21,917; 22,553

YOU USE LESS POWER...
SAVE CONDENSER WATER...
SAVE UPKEEP COST

For large refrigeration systems, NIAGARA gives you a choice between a battery of condensers (that may be cut on or off with the load) or a high capacity condenser that saves space.

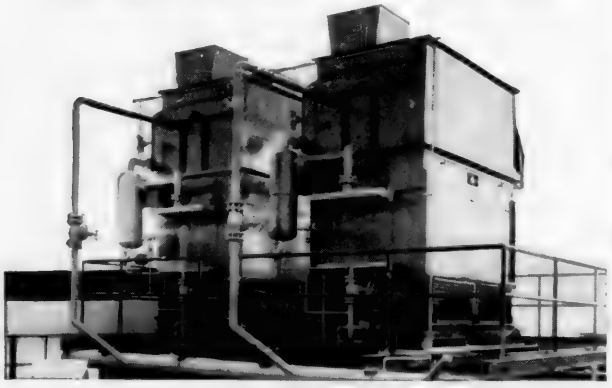
Both have the patented "Duo-Pass" and "Oilout" that remove superheat and keep the system free of oil. Results: you save one-third or more of power cost and upkeep expense. Niagara Patented Balanced Wet Bulb Control gives lowest head pressure operation automatically. *Write for Bulletin 111.*

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. HV. 405 Lexington Ave. New York 17, N. Y.

Field Engineers in Principal Cities of U. S. and Canada



CENTRAL SYSTEM

(Continued from page 136)

The system was designed to maintain 80 deg F DB inside when the outside temperature is 100 deg DB. Actually, the system held the inside temperature at 75 deg when it was considerably hotter than 100 deg.

• **EQUIPMENT**—A chilled water system was installed using a single, centrally located 240-ton Trane compressor and a fan-coil unit in each apartment. The 240-ton Centravac was placed in a central equipment room along with four gas-fired water heaters. The heaters provide the hot water for the heating cycle.

A single network of pipes carries hot water in winter and chilled water in summer to the four apartment buildings.

• **AIR HANDLING**—Each apartment is equipped with a single horizontal fan-coil unit furred into a central hall ceiling. Conditioned air is discharged into a plenum and is distributed through high sidewall supply grilles to each room. The nine-inch depth of the air conditioner made possible easy concealment in the ceiling and resulted in saved closet space which otherwise might have been used for a self-contained package unit.

REED GETS NICHOLLS AWARD

for achievements in field of solid fuels; with National Coal Association, he heads engineering department.

C. A. Reed, director of the Engineering Department of National Coal Association, on October 25 received the Percy Nicholls Award for his "outstanding achievement in the field of solid fuels."

The annual award, bestowed by the Coal Division of American Institute of Mining and Metallurgical Engineers and the Fuels Division of ASME, was presented on behalf of the two mining societies by J. B. Morrow. Presentation was made at the dinner session of the 19th annual Solid Fuels Conference in Washington sponsored by the two groups.

The award to Mr. Reed was the 15th presentation in honor of the late Percy Nicholls who for almost 50 years was a leader in the advancement and development of the utilization of coal for heat and power. At his death in 1942, Mr. Nicholls had been for 19 years supervising engineer of the Fuels Section of the Central Experimental Station of the Bureau of Mines at Pittsburgh.

Mr. Reed, a graduate of the University of Wisconsin, established the Engineering Department of NCA in 1936. Prior to that he had served in the U. S. Signal Corps and Army Engineer Corps from the beginning of World War I until 1920 when he resigned from the Army to become associated with the Green Engineering Co. of Chicago, later merged with the Combustion Engineering

Corp. He subsequently joined the Pittsburgh Coal Company in Pittsburgh and thereafter entered the employ of National Coal Association.

As head of the Engineering Department of NCA, Mr. Reed pioneered the first nationwide fuel engineering service in the coal industry and he was active in the organization of Bituminous Coal Research, Inc., which he has for many years served as Secretary and Secretary-Treasurer.

Canadian Degree Days for October, 1956*

City	October		Cumulative	
	1956	Normal**	1956	Normal
Calgary, Alta.	835	710	1263	1120
Charlottetown, P. E. I.	546	550	852	790
Crescent Valley, B. C.	699	680	1028	1010
Edmonton, Alta.	815	750	1262	1190
Fort William, Ont.	590	740	1098	1110
Grande Prairie, Alta.	942	800	1466	1250
Halifax, N. S.	448	469	696	659
London, Ont.	422	490	706	640
Medicine Hat, Alta.	618	600	913	900
Moncton, N. B.	598	590	981	850
Montreal, P. Q.	488	550	804	740
North Bay, Ont.	555	670	1022	990
Ottawa, Ont.	522	580	871	780
Penticton, B. C.	550	520	742	720
Prince George, B. C.	897	750	1375	1210
Quebec City, P. Q.	608	650	1010	940
Regina, Sask.	772	750	1192	1120
St. John, N. B.	596	590	966	950
Saskatoon, Sask.	802	760	1243	1140
Timmins, Ont.	599	780	1106	1190
Toronto, Ont.	362	465	614	619
Vancouver, B. C.	507	440	754	660
Victoria, B. C.	512	410	811	640
Windsor, Ont.	287	410	471	530
Winnipeg, Man.	589	686	1028	997

* These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.
** New normal figures covering 30-year period, 1921 to 1950.
The Department reports a slight revision in the figures for September, as published in last month's issue. Corrected figures are: Charlottetown, P. E. I., 311; Quebec City, P. Q., 404.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

SOLAR ENERGY SYMPOSIUM—Two-day symposium on solar furnace design and operation, sponsored by the Association for Applied Solar Energy, in conjunction with Stanford Research Institute, Arizona State College and the University of Arizona, to be held at the Hotel Westward Ho, Phoenix, Ariz. J. I. Yellott, secretary of the Association, 3424 N. Central Ave., Phoenix, Ariz. ..... **JANUARY 21-22, 1957.**

PLANT MAINTENANCE SHOW—Eighth National Plant Maintenance and Engineering Show at the Public Auditorium, Cleveland, Ohio. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ..... **JANUARY 28-31, 1957.**

INDUSTRIAL VENTILATION CONFERENCE—Sixth annual Industrial Ventilation Conference, to be held at Kellogg Center, Michigan State University, East Lansing, Mich. Public relations department of Michigan State, E. Lansing, Mich. ..... **FEBRUARY 18-21, 1957.**

ASHAE MEETING—63rd annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at the Conrad Hilton Hotel, Chicago, Ill. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **FEBRUARY 25-28, 1957.**

HEATING AND AIR-CONDITIONING EXPOSITION—13th International Heating and Air-Conditioning Exposition, at the International Ampitheater, Chicago, Ill. E. K. Stevens, manager, International Heating and Air-Conditioning Exposition Co., 480 Lexington Ave., New York 17, N. Y. ..... **FEBRUARY 25-MARCH 1, 1957.**

(Concluded on page 158)

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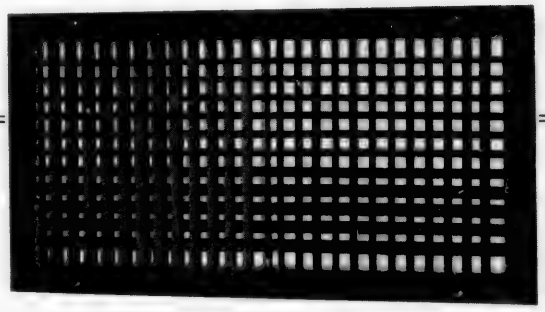

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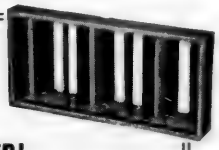

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(Concluded from page 157)

CORROSION ENGINEERS MEETING—13th annual conference and exhibition of the National Association of Corrosion Engineers, at Kiel Auditorium, St. Louis, Mo. A. B. Campbell, executive secretary of the Association, 1061 M & M Building, Houston 2, Tex. ..... **MARCH 11-14, 1957.**

ATOMIC ENERGY CONFERENCE—Fifth conference on Atomic Energy in Industry, sponsored by the National Industrial Conference Board, at the Benjamin Franklin Hotel and Convention Hall, Philadelphia, Pa. Public information department of the National Industrial Conference Board, 460 Park Ave., New York 22, N. Y. ..... **MARCH 14-15, 1957.**

METEOROLOGICAL MEETING—151st National meeting of the American Meteorological Society, to be held at the University of Chicago, Chicago, Ill. Executive secretary of the Society, 5 Joy St., Boston 8, Mass. ..... **MARCH 19-21, 1957.**

METALS CONGRESS AND EXPOSITION—10th Western Metal Congress and Exposition, sponsored by the American Society for Metals, and other technical groups, at the Pan-Pacific Auditorium and the Ambassador Hotel, Los Angeles, Calif. W. H. Eisenman, managing director of the Society, 7301 Euclid Ave., Cleveland 3, Ohio. ..... **MARCH 25-29, 1957.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **APRIL 8-10, 1957.**

WARM AIR HEATING SHORT COURSE—1957 Warm Air Heating Short Course, sponsored by Purdue University, West Lafayette, Ind., to be held at the University. Prof. F. B. Morse, School of Mechanical Engineering, Purdue University, West Lafayette, Ind. ..... **APRIL 15-18, 1957.**

REFRIGERATION INSTITUTE MEETING—Annual meeting of the Air-Conditioning and Refrigeration Institute, at The Homestead, Hot Springs, Va. Executive secretary of the Institute, 1346 Connecticut Ave., N. W., Washington, D. C. ..... **MAY 6-8, 1957.**

MECHANICAL CONTRACTORS MEETING—Annual meeting of The Mechanical Contractors Association of America (formerly Heating, Piping and Air Conditioning Contractors National Association) at the Hotel Fontainebleau, Miami Beach, Fla. L. B. Gruman, Jr., secretary of the Association, 30 Rockefeller Plaza, New York 20, N. Y. ..... **MAY 7-10, 1957.**

DESIGN ENGINEERING SHOW—Design Engineering Show to be held at the Coliseum, New York City. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ..... **MAY 20-23, 1957.**

NDHA MEETING—48th annual meeting of the National District Heating Association, at The Homestead, Hot Springs, Va. J. F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh, Pa. ..... **JUNE 3-6, 1957.**

TESTING MATERIALS MEETING—60th annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 16-21, 1957.**

ASHAE MEETING—Semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at Murray Bay, Quebec. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **JUNE 24-27, 1957.**

CIVIL ENGINEERS EXHIBIT—Annual meeting and Civil Engineering Show of the American Society of Civil Engineers at Hotel Statler, New York, N. Y. Secretary of the Society, 33 W. 39th St., New York 18, N. Y. ..... **OCTOBER 14-18, 1957.**

INDUSTRIAL DEVELOPMENT CONFERENCE—International Industrial Development Conference, sponsored jointly by Time-Life International, and Stanford Research Institute, at the Fairmount Hotel, San Francisco, Calif. E. S. Prentice, executive secretary, Stanford Research Institute, Menlo Park, Calif. ..... **OCTOBER 14-18, 1957.**

AIR-CONDITIONING AND REFRIGERATION EXPOSITION—10th exposition of the Air-Conditioning and Refrigeration industry, sponsored by the Air-Conditioning and Refrigeration Institute, at Chicago's International Amphitheater, Chicago, Ill. Secretary of the Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 18-21, 1957.**

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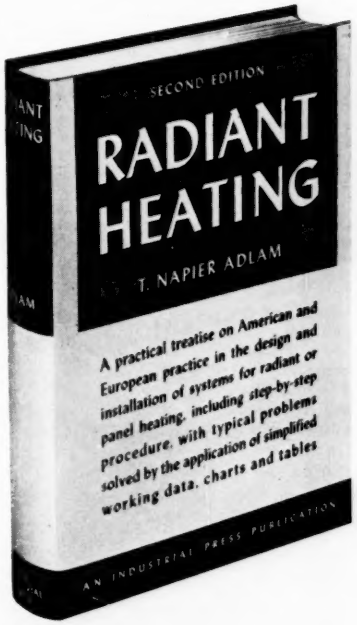
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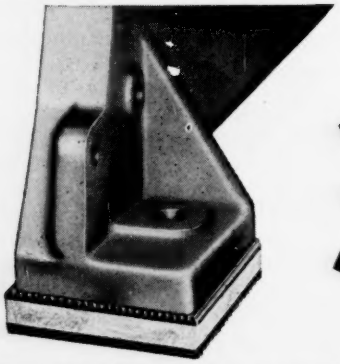

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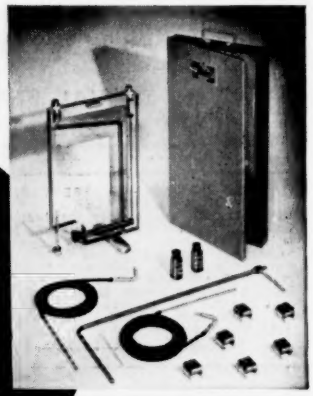

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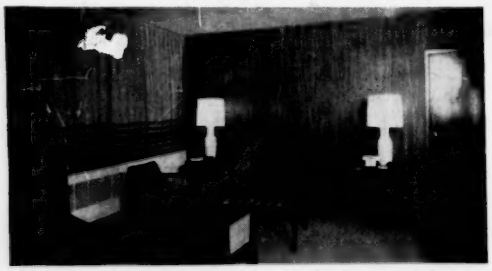

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